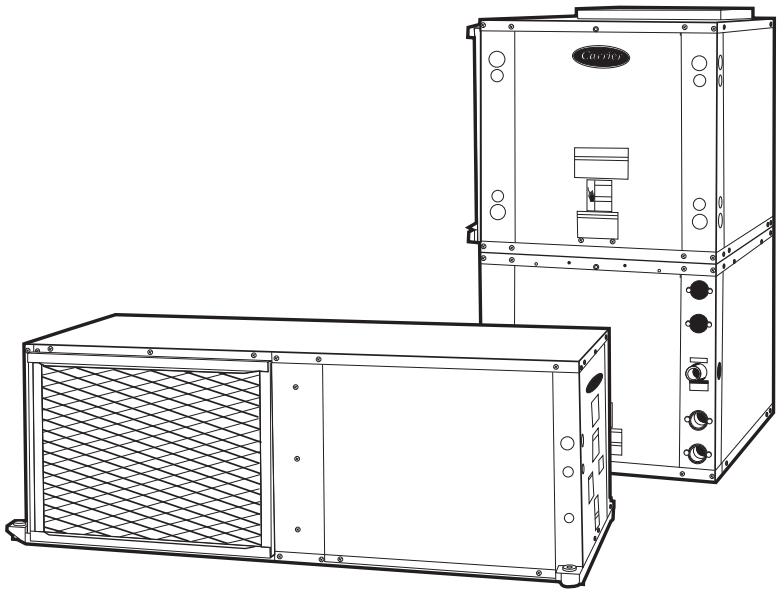
Product Data

AQUAZONE™ 50RDS, RHS, RVS015-070 Premium Efficiency Water Source Heat Pumps

1 1/3 to 6 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Single-package horizontally and vertically mounted water source heat pumps with electronic controls.

- Premium efficiency design
- Performance certified to ARI/ISO/ASHRAE 13256-1
- Wide application use with an extended operating temperature range of 20 F to 110 F
- Thermostatic expansion valve (TXV) provides efficient and reliable refrigerant flow
- Available mute package for quiet operation
- Three service panels for compressor section for easy maintenance
- Spring-mounted compressors for quiet operation
- Ease of installation with factory-mounted downflow option, flow regulators, hot water generator, and control valves
- Flexible and reliable controls (LON and PremierLink™ controller) accommodate all systems
- Modulating hot water reheat (HWR) available for dehumidification capability

Features/Benefits

Carrier's Aquazone premium efficiency water source heat pumps are a high quality, ultra-efficient solution for all boiler/tower and geothermal design applications.

Operating efficiency

Carrier horizontal and vertical water source heat pumps (WSHPs) are designed for quality and high performance over a lifetime of operation. Premium efficiency models offer cooling EERs (Energy Efficiency Ratios) to 16.0 and heating COPs (Coefficiency of Performance) to 5.3.

Features/Benefits (cont)

All efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1 and provide among the highest ratings in the industry, exceeding ASHRAE (American Society of Heating, Refrigerant and Air Conditioning Engineers) 90.1 Energy Standards.

High quality construction and testing

All units are manufactured to meet extensive quality control protocol from start to finish through an automated control system, which provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Aquazone™ units include:

Cabinet — Standard unit fabrication consists of heavy gage galvanized sheet metal cabinet construction designed for part standardization (i.e., minimal number of parts) and modular design. Cabinet interior surfaces are lined with $^1/_2$ in. thick, $1^1/_2$ lb acoustic type insulation. Sheet metal surfaces are treated for maximum corrosion protection to ensure resilience for long term vitality. Compact cabinet dimensions are designed to fit tight space limitations in both horizontal and vertical configurations.

Compressor — Premium efficiency models offer a rotary compressor design in 015 and 018 sizes and scroll compressor design for sizes 024 through 070. Compressor isolating springs are specially selected for each compressor size. The external springs are mounted on an isolated railing system (i.e., from the cabinet) that maximizes vibration isolation and minimizes transmission to the unit structure.

Blower and motor assembly — Permanent split capacitor (PSC) three-speed blowers are provided with all units to satisfy many air distribution applications. Blowers provide an upgrade in certain sizes for high static conditions and fan speed control to accommodate reduced sound operation. Blowers also allow dehumidification control with the correct controller option. Blower motors are designed to operate at lower temperatures to help improve the reliability of the water source heat pump.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a rotary or scroll compressor. Refrigerant circuits are provided with a standard thermostatic expansion valve (TXV) for higher accuracy and performance. Also standard are a reversing valve (4-way valve), water-to-refrigerant coaxial (tube in tube) coil, and enhanced aluminum fin/rifled copper tube air to refrigerant heat exchanger coil. High-efficiency units are provided with larger air to refrigerant coils for combined ultra high efficiency.

ARI/ISO — Aquazone units have ARI (Air Conditioning & Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or ETL labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes of operation. Water source heat pumps are New York City MEA (Materials Equipment and Acceptance) 60-00-E rated.

Quiet operation

Fan motor insulation and compressor springs are provided for sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are utilized for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal and downflow units are field convertible from left or right discharge to back discharge. Vertical units are available in three airflow patterns including top discharge with right or left return. Extended water temperature range between 20 F and 110 F offers maximum design flexibility for all applications. Water flow rates as low as 1.5 gpm per ton assist with selection from a various range of circulating pumps. Factory-installed options are offered to meet specific design requirements.

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Safe, reliable operation

Standard safety features for the refrigerant circuit include high-pressure switch, low-pressure sensor to detect loss of refrigerant, and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hangar isolation brackets. Vertical units are provided with an internally trapped condensate drain to reduce labor associated with installing an external trap for each unit. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide ease of maintenance. Units allow access to the compressor section from 3 sides and have large removable panels for easy access. Additional panels are provided to access the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance. Blower inlet rings allow removal of the blower wheel without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with flexible alternatives for many direct digital control (DDC) applications including the Carrier Comfort Network® (CCN) and open protocol systems.

Carrier's Aquazone standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C control system is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50-va transformer — The transformer assists in accommodating accessory loads.

Anti-short cycle timer — Timer provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Random start relay ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — This protection safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — The electronic sensor is mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty continuous seconds of overflow is recognized as a fault by the sensor.

High and low voltage protection — This safety protection for excessive or low voltage conditions.

Automatic intelligent reset — Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — Twenty-four volt output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance Monitor (PM) — This unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or anti-freeze) — A field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — A field selectable switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — A selectable 24 V or pilot duty dry contact provides activation of a remote alarm.

Electric heat option — An output is provided on the controller for operating two stages of emergency electric heat.

Open protocol for diverse control — The LON controller option is ideal when building automation requires interoperability across diverse control platforms. This LONMark® compliant offering can operate as standalone or as a part of Local Operating Network (LON) via the LonWorks® FTT-10 Free Topology communication network. Factory completed, pre-engineered application specific to Aquazone water source heat pumps and digital wall sensors communicating over Sensor Link (S-Link) communication protocol

Features/Benefits (cont)

completes a system of networked control.

Humidity control — Aquazone™ 50RDS, RHS, RVS units provide very good latent capacity and are an excellent choice for controlling humidity within a zone in many applications. The latent capacity of the units can be increased based on zone conditions with either the use of fan speed control and a humidistat or with the modulating hot water reheat option. The Deluxe D controls option provides fan speed control based on relative humidity and is an effective, low-cost means of controlling humidity. For certain applications in which a significant amount of latent capacity is required, the modulating hot water reheat option is a good solution.

Service test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

PremierLink™ controller adds reliability, efficiency, and simplification

The PremierLink direct digital controller can be ordered as a factory-installed option. Designed and manufactured exclusively by Carrier, the controller can be used to actively monitor and control all modes of operation as well as monitor the following diagnostics and features: unit number, zone temperature, zone set point, zone humidity set point, discharge air temperatures, fan status, stages of heating, stages of cooling, outdoor-air temperature, leaving-air temperature, leaving water temperature, alarm status, and alarm lockout condition.

This controller has a 38.4 kilobaud communications capability and is compatible with *Comfort*Link™ controls, CCN and ComfortVIEW™ software. The scrolling marquee and Navigator™ display are optional tools that can be used for programming and monitoring the unit for optimal performance. The addition of the Carrier CO_2 sensor in the conditioned space provides ASHRAE 62-99 compliance and demand controlled ventilation (DCV). A DCV control strategy is especially beneficial for a water source heat pum system to minimize the energy utilized to condition ventilation air. The DCV approach enhances the energy efficient performance of the Aquazone unit.

The PremierLink peer-to-peer, Internet ready communicating control is designed specifically for constant volume (CV) and variable volume/variable temperature (VVT®) applications. This comprehensive controls system allows water source heat pumps to be linked together to create a fully functional HVAC (heating, ventilation, and air conditioning) automation system.

Model number nomenclature

50RDS, RHS, RVS PREMIUM EFFICIENCY

50RH S 015 S D C 5 0 1 3 0

Aquazone™ Water Source Heat Pump
50RD – Downflow Configuration
50RH – Horizontal Configuration
50RV – Vertical Configuration

Efficiency Type
S – Premium Efficiency

Size – Nominal Tons

015	1-1/3	**042**	3-1/2
018	1-1/2	**048**	4
024	2	**060**	5
***030**	2-1/2	**070**	6
***036**	3		

Airflow Configuration

50RHS Units

Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

50RHS030 and 036 High-Static Units†

Code	Return	Discharge
D	Left	Right
F	Left	Back
A	Right	Left
C	Right	Back

50RVS Units

Code	Return	Discharge
L	Left	Top
R	Right	Top

50RVS030 and 036 High-Static Units†

Code	Return	Discharge
M	Left	Top
G	Right	Top

50RDS Units

Code	Return	Discharge
L	Left	Bottom
R	Right	Bottom

50RDS030 and 036 High-Static Units†

Code	Return	Discharge
M	Left	Bottom
G	Right	Bottom

Controls
C – Complete C Microprocessor Control
D – Deluxe D Microprocessor Control
L – Complete C with LON**
M – Deluxe D with LON**
P – Complete C with PremierLink™ Communicating Control

Water Circuit Options
0 – None
2 – Hot Water Generator (HWG) Coil Only
8 – Auto Flow Regulator Sized for 2.5 Gpm/Ton
9 – Auto Flow Regulator Sized for 3.0 Gpm/Ton

Operating Range
1 – Extended Range (20 to 110 F)
2 – Extended Range (20 to 110 F) with Mute Package
3 – Standard Range (60 to 95 F)
4 – Standard Range (60 to 95 F) with Mute Package

Packing
1 – Single Pack

Revision Code
0 – Current Revision

V-Ph-Hz
1 – 575-3-60***
3 – 208/230-1-60
4 – 265-1-60†††
5 – 208/230-3-60
6 – 460-3-60

Heat Exchanger

Valve Type	Non-Coated Air Coil		Coated Air Coil	
	Copper	Cupronickel	Copper	Cupronickel
Standard	C	N	A	J
Motorized Valve	T	S	U	W
HWR††	E	P	D	F

LEGEND

HWG — Hot Water Generator

HWR — Hot Water Reheat

*Sizes 030 and 036 also available as high static.

†High static not available with HWR.

**LON — LonWorks® interface system.

††Must order Deluxe D when selecting HWR option. Units with the HWR option installed in an open loop application require an internal bronze pump. The cupronickel heat exchanger option, which includes a bronze pump, must be used. Failure to select this option could result in premature equipment failure. The HWR is not recommended for applications with poor water quality. The copper heat exchanger with cast iron pump (standard modulating reheat option) is designed for closed loop systems.

***Only sizes 042-070 are available as 575-3-60.

†††Size 036 high static not available as 265-1-60.

ARI/ISO capacities

50RDS, 50RHS, 50RVS WATER LOOP APPLICATIONS

UNIT 50RDS, RHS, RVS	PRESSURE DROP		GPM	CFM	EWT			
					Cooling 86 F		Heating 68 F	
	PSI	Ft			TC (Btuh)	EER (Btuh/W)	TC (Btuh)	COP
015	1.3	3.0	3.8	500	14,100	16.0	16,300	5.3
018	1.6	3.7	4.5	600	17,100	14.8	20,900	5.0
024	1.5	3.5	6.0	800	24,200	14.9	31,000	4.8
030	2.2	5.1	8.0	1000	28,900	15.1	35,000	4.8
036	3.4	7.9	9.0	1150	33,800	14.9	40,400	4.6
042	4.4	10.2	10.5	1400	41,000	14.5	49,800	4.8
048	5.5	12.7	12.0	1600	45,800	14.6	54,100	4.9
060	3.1	7.2	15.0	2000	56,800	13.4	74,900	4.7
070	4.3	9.9	18.0	2300	63,700	12.4	78,300	4.5

LEGEND

COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
TC — Total Capacity

NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of 60 F to 90 F.
3. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-320.

50RDS, 50RHS, 50RVS GROUND LOOP APPLICATIONS

UNIT 50RDS, RHS, RVS	PRESSURE DROP		GPM	CFM	EWT			
					Cooling 77 F		Heating 32 F	
	PSI	Ft			TC (Btuh)	EER (Btuh/W)	TC (Btuh)	COP
015	1.5	3.5	3.8	500	14,900	18.5	11,200	3.8
018	1.8	4.2	4.5	600	18,300	16.7	13,200	3.6
024	1.8	4.2	6.0	800	26,000	17.1	19,200	3.6
030	2.6	6.0	8.0	1000	30,700	16.9	22,200	3.6
036	3.9	9.0	9.0	1150	35,800	16.4	26,700	3.4
042	5.1	11.8	10.5	1400	43,300	16.0	32,700	3.7
048	6.4	14.8	12.0	1600	48,900	16.4	36,900	3.7
060	3.6	8.3	15.0	2000	59,400	14.6	48,700	3.6
070	5.0	11.6	18.0	2300	67,100	13.4	53,400	3.6

LEGEND

COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
TC — Total Capacity

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or be submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 110 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-330.

ARI/ISO capacity notes

1. Cooling capacities based upon 80.6 F db (dry bulb), 66.2 F wb (wet bulb) entering-air temperature.
2. Heating capacities based upon 68 F db, 59 F wb entering-air temperature.
3. All ratings based upon 208 volt operation.
4. All ARI performance is based upon airflow rated at high speed.

Physical data

PHYSICAL DATA — 50RDS,RHS,RVS015-070 UNITS

UNIT 50RDS,RHS,RVS	015	018	024	030	036	042	048	060	070
NOMINAL CAPACITY (Btuh)	14,100	17,100	24,200	28,900	33,800	41,000	45,800	56,800	63,700
COMPRESSOR (1 each)	Rotary		Scroll						
FACTORY CHARGE R-22 (oz)	44	44	48	48	60	74	74	102	104
PSC FAN MOTOR AND BLOWER									
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor (Hp)	1/6	1/6	1/5	1/3	1/2	1/2	3/4	3/4	1
Blower Wheel Size (D x W) (in.)	9 x 7	9 x 7	9 x 7	9 x 7	9 x 7	10 x 10	10 x 10	11 x 10	11 x 10
WATER CONNECTION SIZE (FPT) (in.)	3/4	3/4	3/4	3/4	3/4	1	1	1	1
HWG CONNECTION SIZE (FPT) (in.)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
VERTICAL									
Air Coil									
Dimensions (H x W) (in.)	20 x 20		24 x 20		28 x 20	28 x 25		32 x 25	36 x 25
Total Face Area (sq ft)	2.8		3.3		3.9	4.9		5.6	6.3
Tube Size (in.)	3/8		3/8		3/8	3/8		3/8	3/8
Fin Spacing (FPI)	12		12		12	10		10	10
Number of Rows	3		3		3	4		4	4
Filter Standard — 1-in. Throwaway (Qty — Size) (in.)	1 — 20 x 24		1 — 24 x 24		2 — 14 x 24	2 — 14 x 30		2 — 10 x 30 1 — 12 x 30	3 — 12 x 30
Weight (lb)									
Operating	174	184	250	252	266	323	327	416	443
Packaged	184	194	260	262	276	333	337	426	453
HORIZONTAL									
Air Coil									
Dimensions (H x W) (in.)	18 x 22		18 x 27		18 x 31	20 x 35		20 x 40	20 x 45
Total Face Area (sq ft)	2.8		3.4		3.9	4.9		5.6	6.3
Tube Size (in.)	3/8		3/8		3/8	3/8		3/8	3/8
Fin Spacing (FPI)	12		12		12	10		10	10
Number of Rows	3		3		3	4		4	4
Filter Standard — 1-in. Throwaway (Qty — Size)	1 — 18 x 24		2 — 18 x 18		2 — 18 x 18	1 — 12 x 20 1 — 20 x 25	1 — 12 x 20 1 — 20 x 25	1 — 18 x 20 1 — 24 x 20	2 — 24 x 20
Weight (lb)									
Operating	179	189	250	252	266	323	327	416	443
Packaged	189	199	260	262	276	333	337	426	453

LEGEND

FPI — Fins per Inch
HWG — Hot Water Generator
PSC — Permanent Split Capacitor

NOTES:
1. All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2 and 3/4-in. electrical knockouts.
2. Sizes 030 and 036 available as high-static units.

Options and accessories

DESCRIPTION	FACTORY-INSTALLED OPTIONS	FIELD-INSTALLED OPTIONS
Cupronickel Heat Exchangers	X	
Sound Attenuation Package (Mute Package)	X	
Extended Range	X	
High-Static Blower (sizes 030 and 036 only)	X	
Hot Water Generator	X	
Water Circuit Options	X	
Two-Way Motorized Control Valve	X	
Modulating Hot Water Reheat	X	
Deluxe D Control System	X	
PremierLink™ Controller	X	
LONMark® Compliant Controller	X	
Aquazone™ Thermostats		X
Loop Controller		X
Filter Rack (2 in.)		X
Fire-Rated Hoses		X
Ball Valves		X
Y strainers		X
Solenoid Valves		X
Hose Kit Assemblies		X
Remote Sensors		X
PremierLink™ Accessories		X

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied, access panels are double dampened with $^1/_2$-in. thick density fiberglass insulation, and a unique application of special dampening material is applied to the curved portion of the blower. The mute package in combination with standard unit noise reduction features (i.e., as mentioned previously) provides sound levels and noise reduction to the highest degree.

Extended range units insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 60 F). Units are capable of operating at a range of 20 to 110 F.

High-static blower is available on sizes 030 and 036 for the RDS, RHS, RVS models for all airflow configurations. This option specifically provides increased airflow at various static pressure conditions, to provide even more flexibility to Carrier's high blower performance in the standard offering for each model number.

Hot water generator coil and 125 F high temperature switch generate hot water using the unit. Hot water pumps are not provided with this option.

Water circuit options provide internally mounted 2.5 or 3.0 gpm per ton automatic flow regulating valves for easier installation.

Two-way motorized control valve can be provided with a copper heat exchanger for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

Modulating hot water reheat diverts condenser water through a water-to-air coil that is placed after the evaporator coil. The modulating reheat valve automatically adjusts reheat capacity based upon leaving-air temperature and loop entering-water temperature to provide 100% reheat and neutral supply air to the space.

Deluxe D control system provides the same functions as the Complete C control system while incorporating additional flexibility and functions to include:

Thermostat input capabilities accommodate emergency shutdown mode and night setback with override (NSB) potential. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) provides ability to work and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) provides selection for heat pump O/B thermostats.

Dehumidistat input provides operation of fan control for dehumidification operation.

Multiple units on one thermostat/wall sensor provide communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature provides selection of boilerless changeover temperature set point.

Accessory relays allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

PremierLink™ controller is compatible with the Carrier Comfort Network® (CCN) and other building automation systems (BAS). This control is designed to allow users the access and ability to change factory-defined settings, thus expanding the function of the standard unit.

LONMark® compliant controller contains the factory-loaded Aquazone water source heat pump application for an interoperable control solution.

Field-installed accessories

Carrier's line of Aquazone™ thermostats are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable with copy command, 4 settings per day, fully electronic, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, NEVERLOST™ memory, 3 security levels, temperature display in degrees F or C.

Programmable 7-day light-activated thermostat offers the same features as the 7-day programmable thermostat and includes occupied comfort settings with lights on, unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat offers the same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, 4 settings per day.

Non-programmable thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, large display, backlit display, O or B terminal, dual set point with adjustable deadband, and backplate with terminals.

Loop controller with six stages (2 stages for heating and 4 stages for cooling) includes:

- Loop temperature alarms
- Two pump single loop flow monitoring with the ability to manually select the lead pump
- One common alarm signal and indicating light and one audible alarm
- Loop water temperature sensor test circuit
- Functional test simulation from operator keypad
- Real timeclock, industrial noise ratings
- Loop water temperature control switch
- Loop controller with six stages (2 stages for heating and 4 stages for cooling)

Filter rack (2 in.) is available in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The 2-in. filter rack does not include filters.

Fire-rated hoses are 2 ft long and have a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits are provided with both a supply and return hose and can be either stainless steel or galvanized. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Ball valves (brass body) are used for shutoff and balancing water flow and are available with memory, memory stop, and pressure temperature ports. Valves consist of UL-listed brass body, ball and stem type with Teflon seats and seals. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Y strainers (bronze body) are "Y" type strainers with a brass cap. With a maximum operating pressure rating of 450 psi, the strainer screen is made of stainless steel. Strainers are available with blow down valves. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, and .312 amps holding. Valves operate slowly for quiet system application. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

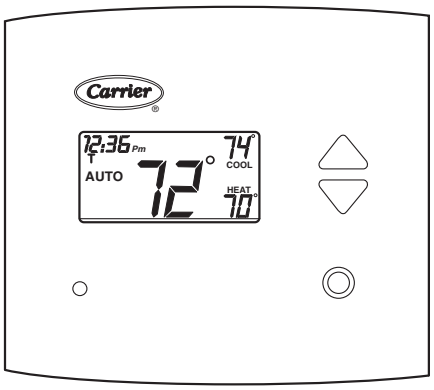
Hose kit assemblies provide all the necessary components to hook up a water-side system. Supply hose includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset automatic balancing valve (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.

Remote sensors are available for Aquazone flush mount thermostats. Available sensors are for wall (wired and wireless) or duct mounted applications.

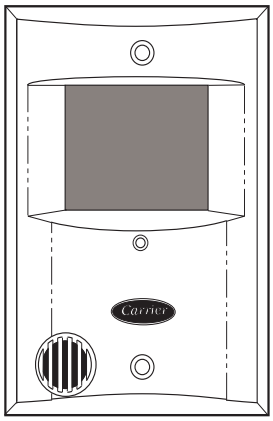
PremierLink accessories are available for providing a fully integrated WSHP DDC system. Accessories include supply air temperature sensors (with override and/or set-point adjustment), communicating room sensors, CO_2 sensors (for use in demand control ventilation), and linkage thermostats (to control multiple units from one thermostat).

Options and accessories (cont)

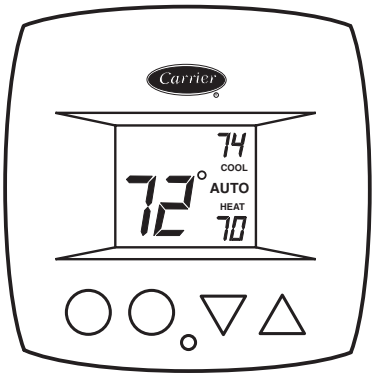
AQUAZONE™ THERMOSTATS



7-DAY PROGRAMMABLE/LIGHT-ACTIVATED PROGRAMMABLE

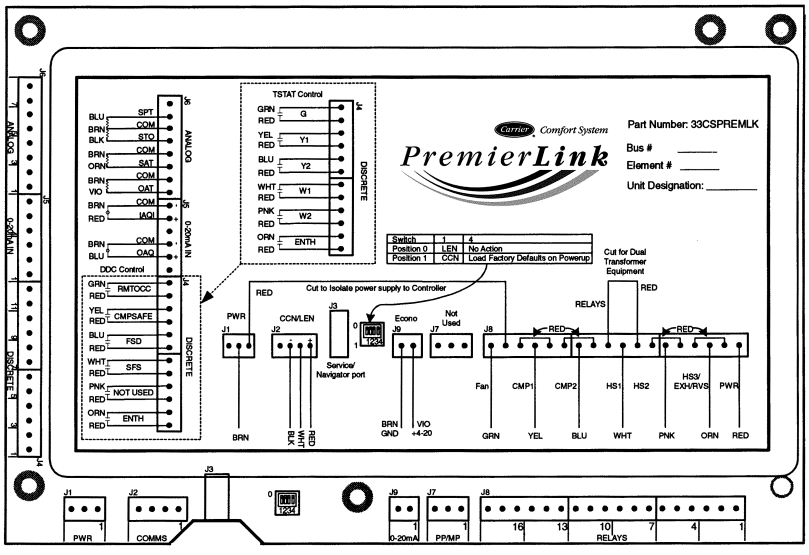


7-DAY PROGRAMMABLE FLUSH MOUNT



5-DAY PROGRAMMABLE/NON-PROGRAMMABLE

PREMIERLINK™ COMMUNICATING CONTROL



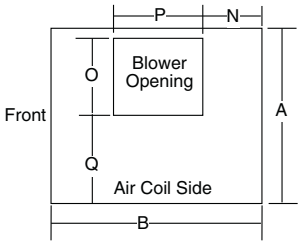
Dimensions

50RDS015-070 UNITS

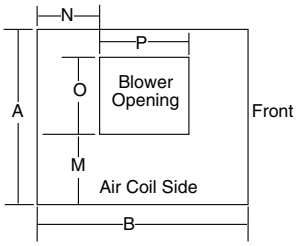
50RDS UNIT		OVERALL CABINET (in.)			WATER CONNECTIONS (in.)							ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Outlet Opening Only (in.)					RETURN CONNECTION Using Return Air Opening (in.)			
					1	2	3	4	5	Loop Water FPT (in.)	HWG FPT (in.)	J 1/2 conduit	K 1/2 conduit	L 3/4 conduit									
		A Width	B Depth	C Height	D In	E Out	F HWG In	G HWG Out	H Cond-ensate			Low Voltage	Ext Pump	Power Supply	M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U
015,018	in.	22.4	25.6	44.6	16.9	13.9	5.4	2.4	3.5	3/4	1/2	13.6	9.7	7.2	6.1	8.2	10.4	9.3	11.0	2.2	21.1	20.2	20.4
	cm	56.8	65.1	113.3	42.9	35.3	13.7	6.1	8.9			34.5	24.6	18.3	15.4	20.8	26.4	23.5	27.9	5.6	53.6	51.3	51.8
024,030	in.	22.4	25.6	48.6	16.9	13.9	5.4	2.4	3.5	3/4	1/2	13.6	9.7	7.2	6.1	8.2	10.4	9.3	11.0	2.2	21.1	24.2	20.4
	cm	56.8	65.1	123.4	42.9	35.3	13.7	6.1	8.9			34.5	24.6	18.3	15.4	20.8	26.4	23.5	27.9	5.6	53.6	61.5	51.8
036	in.	22.4	25.6	52.6	16.9	13.9	5.4	2.4	3.5	3/4	1/2	13.6	9.7	7.2	6.1	8.2	10.4	9.3	11.0	2.2	21.1	28.2	20.4
	cm	56.8	65.1	133.6	42.9	35.3	13.7	6.1	8.9			34.5	24.6	18.3	15.4	20.8	26.4	23.5	27.9	5.6	53.6	71.6	51.8
042,048	in.	25.4	30.6	54.6	18.9	15.9	5.4	2.4	3.5	1	1/2	13.1	9.7	7.2	7.2	8.7	13.6	13.3	10.5	2.2	26.1	28.2	22.4
	cm	64.5	77.8	138.7	48.0	40.4	13.7	6.1	8.9			33.3	24.6	18.3	18.3	22.1	34.4	33.7	26.7	5.6	66.3	71.6	56.9
060	in.	25.4	30.6	58.6	18.9	15.9	5.4	2.4	3.5	1	1/2	13.1	9.7	7.2	7.2	8.7	13.6	13.3	10.5	2.2	26.1	32.2	22.4
	cm	64.5	77.8	148.8	48.0	40.4	13.7	6.1	8.9			33.3	24.6	18.3	18.3	22.1	34.4	33.7	26.7	5.6	66.3	81.8	56.9
070	in.	25.4	30.6	62.6	18.9	15.9	5.4	2.4	3.5	1	1/2	13.1	9.7	7.2	7.2	8.7	13.6	13.3	10.5	2.2	26.1	36.2	22.4
	cm	25.4	30.6	159.0	18.9	15.9	5.4	2.4	3.5	1	1/2	13.1	9.7	7.2	7.2	8.7	13.6	13.3	10.5	2.2	26.1	91.9	56.9
		64.5	77.8		48.0	40.4	13.7	6.1	8.9			33.3	24.6	18.3	18.3	22.1	34.4	33.7	26.7	5.6	66.3		

NOTES:
1. Condensate is 3/4-in. PVC FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inch. This bracket should be removed when connecting return duct.

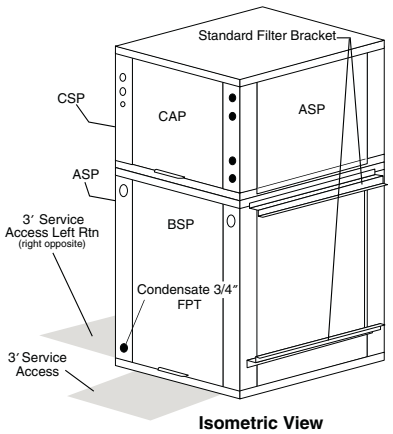
LEGEND
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel
HV — High Voltage
HWG — Hot Water Generator
LV — Low Voltage



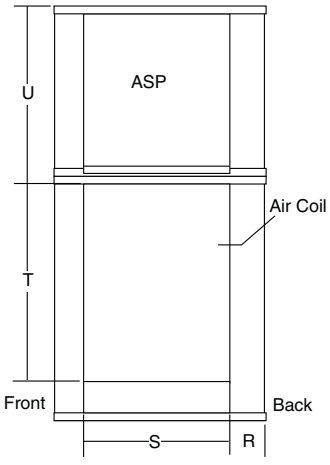
Right Return/Bottom Discharge Floor Foot Print (Top View)



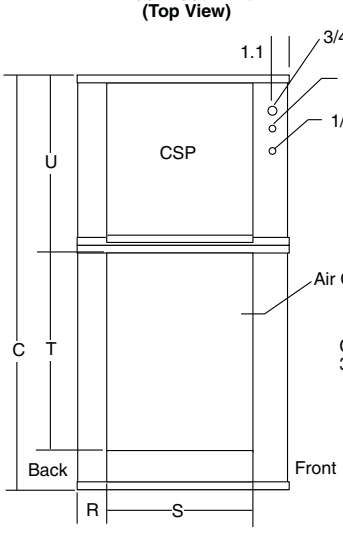
Left Return/Bottom Discharge Floor Foot Print (Top View)



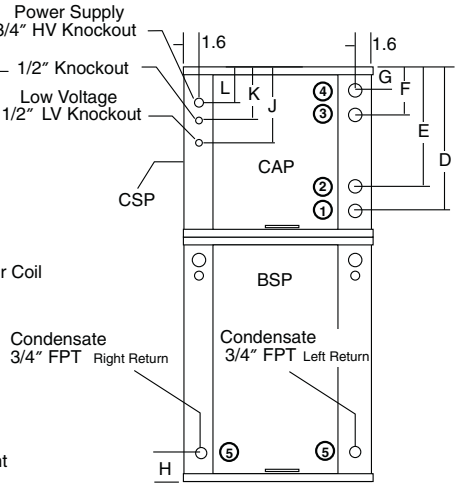
Isometric View



Right Return- Air Coil Opening (Right Side View)



Left Return - Air Coil Opening (Left Side View)



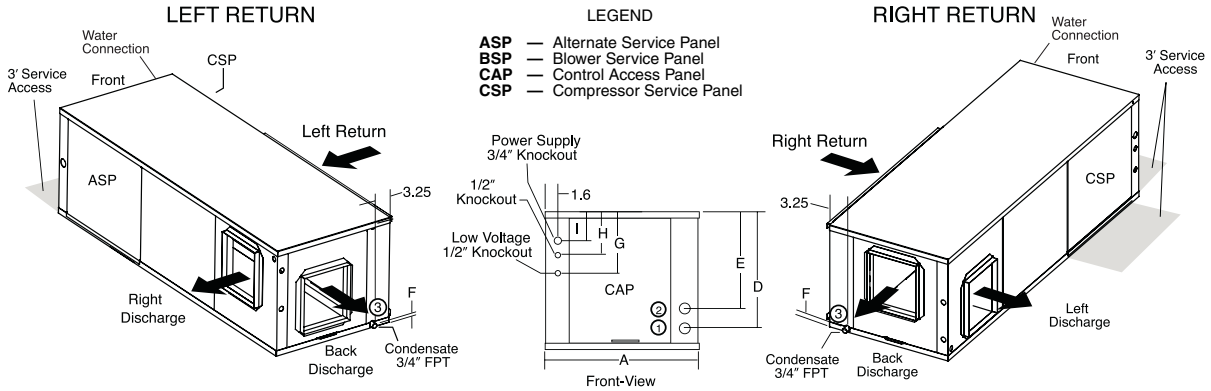
Front-View

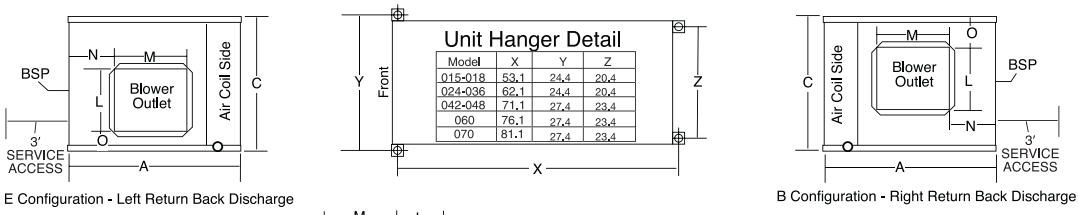
Dimensions (cont)

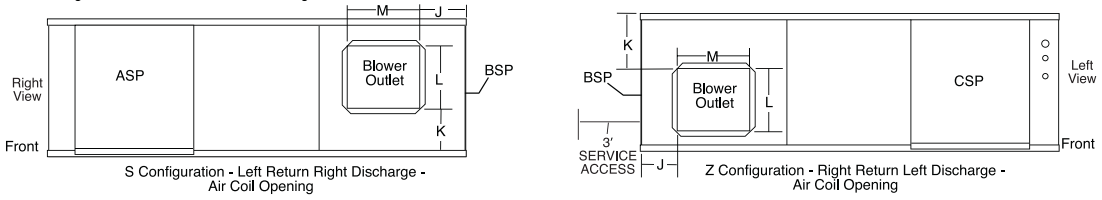
→ 50RHS015-070 UNITS

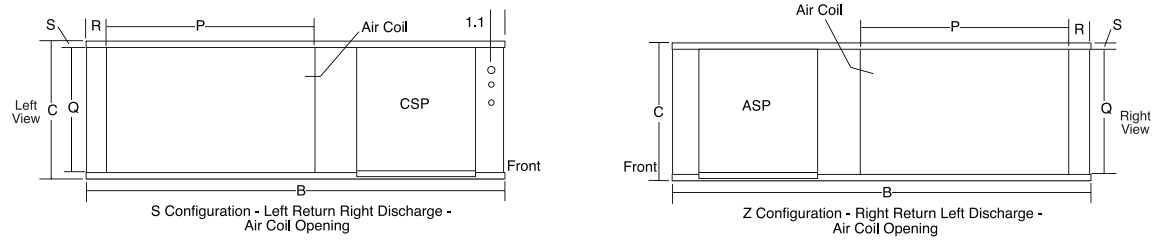
50RHS UNIT		OVERALL CABINET (in.)			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)						RETURN CONNECTION Using Air Coil Opening			
					1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit										
		A Width	B Depth	C Height	D In	E Out	F Cond-ensate		Low Voltage	Ext Pump	Power Supply	J	K	L Supply Height	M Supply Width	N	O	P Return Depth	Q Return Height	R	S
015,018	in.	22.4	53.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	5.0	6.8	10.4	9.3	5.0	2.1	23.1	17.3	2.2	1.0
	cm	56.8	135.1	49.0	6.1	13.7	1.5		14.5	24.6	31.0	12.7	17.3	26.4	23.6	12.7	5.3	58.7	43.9	5.6	2.5
024,030	in.	22.4	62.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	5.0	6.8	10.4	9.3	5.0	2.1	28.1	17.3	6.3	1.0
	cm	56.8	158.0	49.0	6.1	13.7	1.5		14.5	24.6	31.0	12.7	17.3	26.4	23.6	12.7	5.3	71.4	43.9	16.0	2.5
036	in.	22.4	62.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	5.0	6.8	10.4	9.3	5.0	2.1	32.1	17.3	2.2	1.0
	cm	56.8	158.0	49.0	6.1	13.7	1.5		14.5	24.6	31.0	12.7	17.3	26.4	23.6	12.7	5.3	81.5	43.9	5.6	2.5
042,048	in.	25.4	71.2	21.3	2.4	5.4	0.6	1	8.1	11.7	14.2	5.8	5.0	13.6	13.3	4.2	2.9	36.1	19.3	2.2	1.0
	cm	64.5	180.8	54.1	6.1	13.7	1.5		20.6	29.7	36.1	14.7	12.7	34.5	33.8	14.7	7.4	91.7	49.0	5.6	2.5
060	in.	25.4	76.2	21.3	2.4	5.4	0.6	1	8.1	11.7	14.2	5.8	5.0	13.6	13.3	4.2	2.9	41.1	19.3	2.2	1.0
	cm	64.5	193.5	54.1	6.1	13.7	1.5		20.6	29.7	36.1	14.7	12.7	34.5	33.8	14.7	7.4	104.4	49.0	5.6	2.5
070	in.	25.4	81.2	21.3	2.4	5.4	0.6	1	8.1	11.7	14.2	5.8	5.0	13.6	13.3	4.2	2.9	46.1	19.3	2.2	1.0
	cm	64.5	206.2	54.1	6.1	13.7	1.5		20.6	29.7	36.1	14.7	12.7	34.5	33.8	14.7	7.4	117.1	49.0	5.6	2.5

NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed. Isolation grommets are provided.
4. Right and left orientation is determined by looking at water connection side.









AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

50RVS015-070 UNITS

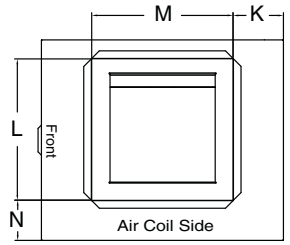
50RVS UNIT		OVERALL CABINET (in.)			WATER CONNECTIONS (in.)				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION Duct Flange Installed (±0.10 in.)					RETURN CONNECTION Using Air Coil Opening			
					1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit									
		A Width	B Depth	C Height	D In	E Out	F Cond-ensate		Low Voltage	Ext Pump	Power Supply	J	K	L Supply Height	M Supply Depth	N	O	P Return Depth	Q Return Height	R
015,018	in.	22.4	25.6	40.6	2.4	5.4	9.8	3/4	6.0	9.5	12.0	7.2	5.8	14.0	14.0	4.3	1.8	22.3	18.2	1.6
	cm	56.8	65.1	103.1	6.1	13.7	24.9		15.2	24.1	30.5	18.3	14.7	35.6	35.6	10.9	4.6	56.6	46.2	4.1
024,030	in.	22.4	25.6	44.6	2.4	5.4	9.8	3/4	6.0	9.5	12.0	7.2	5.8	14.0	14.0	4.3	1.8	22.3	22.2	1.6
	cm	56.8	65.1	113.3	6.1	13.7	24.9		15.2	24.1	30.5	18.3	14.7	35.6	35.6	10.9	4.6	56.6	56.4	4.1
036	in.	22.4	25.6	48.6	2.4	5.4	9.8	3/4	6.0	9.5	12.0	7.2	5.8	14.0	14.0	4.3	1.8	22.3	26.2	1.6
	cm	56.8	65.1	123.4	6.1	13.7	24.9		15.2	24.1	30.5	18.3	14.7	35.6	35.6	10.9	4.6	56.6	66.5	4.1
042,048	in.	25.4	30.6	50.4	2.4	5.4	10.8	1	8.0	11.5	14.0	6.2	6.3	18.0	18.0	5.1	1.5	27.8	26.2	1.5
	cm	64.5	77.8	128.0	6.1	13.7	27.4		20.3	29.2	35.6	15.7	16.0	45.7	45.7	13.0	3.8	70.6	66.5	3.8
060	in.	25.4	30.6	54.4	2.4	5.4	10.8	1	8.0	11.5	14.0	6.2	6.3	18.0	18.0	5.1	1.5	27.8	30.2	1.5
	cm	64.5	77.8	138.2	6.1	13.7	27.4		20.3	29.2	35.6	15.7	16.0	45.7	45.7	13.0	3.8	70.6	76.7	3.8
070	in.	25.4	30.6	58.4	2.4	5.4	10.8	1	8.0	11.5	14.0	6.2	6.3	18.0	18.0	5.1	1.5	27.8	34.2	1.5
	cm	64.5	77.8	148.3	6.1	13.7	27.4		20.3	29.2	35.6	15.7	16.0	45.7	45.7	13.0	3.8	70.6	86.9	3.8

NOTES:
1. Condensate is 3/4-in. FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inches. This bracket should be removed when connecting return duct.
3. Discharge flange field installed.
4. Right and left orientation is determined by looking at water connection side.

LEGEND

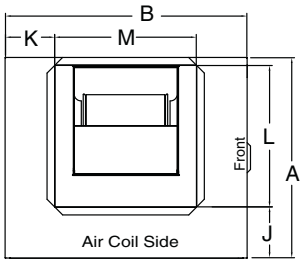
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

RIGHT RETURN

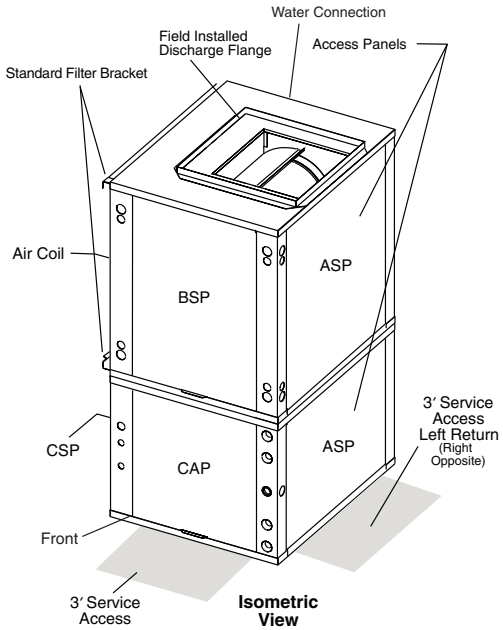


R Configuration - Top Discharge-Right Return (Top View)

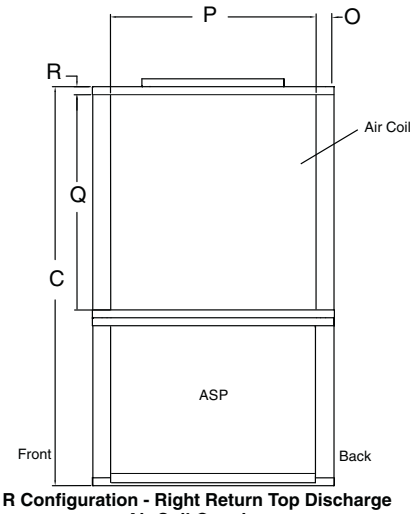
LEFT RETURN



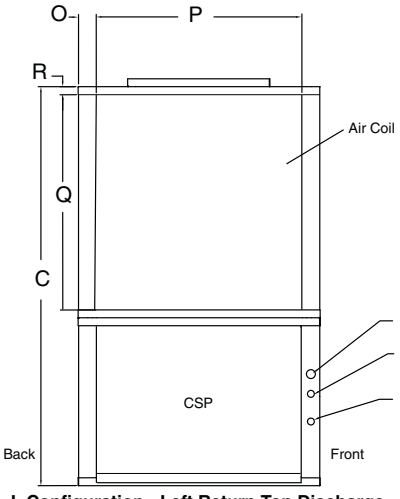
L Configuration - Top Discharge-Left Return (Top View)



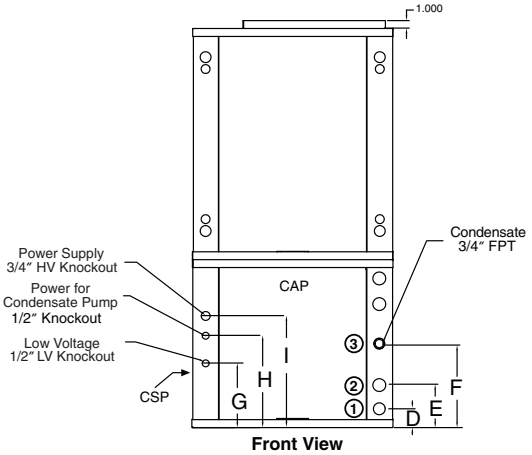
Isometric View



R Configuration - Right Return Top Discharge - Air Coil Opening (Right Side View)



L Configuration - Left Return Top Discharge - Air Coil Opening (Left Side View)



Front View

AIRFLOW CONFIGURATION		
Code	**Return**	**Discharge**
L	Left	Top
R	Right	Top

Selection procedure (with 50RHS024 example)

I Determine the actual cooling and heating loads at the desired dry bulb and wet bulb conditions.

Assume cooling load at desired dry bulb 80 F and wet bulb 65 F conditions are as follows:

Given:

Total Cooling (TC). . . . . .22,100 Btuh
Sensible Cooling (SC) . . . . . .16,500 Btuh
Entering-Air Temperature db . . . . . 80.6 F
Entering-Air Temperature wb . . . . . .65 F

II Determine the following design parameters.

Entering water temperature, water flow rate (gpm), airflow (cfm), water flow pressure drop and design wet and dry bulb temperatures. Airflow cfm should be between 300 and 450 cfm per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Enter the 50RHS024 Performance Data tables and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp . . . . . 90 F
Water Flow (Based upon
12 F rise in temp) . . . . . .4.5 gpm
Airflow Cfm . . . . . .700 cfm

III Select a unit based on total cooling and total sensible cooling conditions. Unit selected should be closest to but not larger than the actual cooling load.

Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50RHS024 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Rejection capacities:

Total Cooling . . . . . .24,900 Btuh
Sensible Cooling . . . . . 17,800 Btuh
Heat of Rejection . . . . . .31,400 Btuh

Read the Heat Capacity. If the Heat Capacity exceeds the design criteria, it is acceptable.

NOTE: It is quite normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Correction Factors tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

a) Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.

b) Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction.

V Determine entering-air and airflow correction using the Correction Factors tables found in this book.

The nominal airflow for the 50RHS024 is 800 cfm. The design parameter is 700 cfm.

800/700 = 88% of nominal airflow:

Use the 88% row in the Nominal CFM correction table.

The Entering-Air Temperature is 65 F wb. Use the 65 F row in the Entering-Air correction table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

	Table	Ent Air	Airflow	Corrected
Corrected Total Cooling	= 24,900 x	0.940 x	0.957 =	22,399
Corrected Sensible Cooling	= 17,800 x	1.125 x	0.917 =	18,363
Corrected Heat of Rejection	= 31,400 x	0.949 x	0.964 =	28,726

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Calculate and assess the water temperature rise.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat Rejection}}{\text{gpm x 500}}$$

For example, using the Corrected Heat of Rejection from the last step:

$$\text{Actual Temperature Rise} = \frac{28{,}726}{4.5 \times 500} = 12.8 \text{ F}$$

If the units selected are not within 10% of the load calculations, review what effect changing the gpm, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

VII ARI/ISO/ASHRAE 13256-1 Conversion

Performance standard ARI/ISO/ASHRAE 13256-1 became effective on January 1, 2000 and replaced the existing ARI Standards 320 Water-Loop Heat Pumps (WLHP), 325 Ground-Water Heat Pumps (GWHP), and 330 Ground-Loop Heat Pumps (GLHP).

The ARI/ISO Standard incorporates a consistent rating methodology for including fan and pump energy for calculating cooling capacity, heating capacity, and energy efficiency ratios (EER). This simplifies the use of rating data for heat pump performance modeling in seasonal energy analysis calculations, and allows for direct rating comparisons across applications.

a) ISO Capacity and Efficiency Equations

The following equations are used to calculate and correct cooling capacity, heating capacity, and respective EER:

ISO Cooling Capacity = (Cooling Capacity in Btuh) + (Fan Power Correction in watts x 3.412)

ISO Cooling EER = (ISO Cooling Capacity in Btuh/3.412)/(Power Input in watts – Fan Power Correction in watts + Pump Power Correction in watts) = watts/watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/watts.

ISO Heating Capacity = (Heating Capacity in Btuh) – (Fan Power Correction in watts x 3.412)

ISO Heating EER = (ISO Heating Capacity in Btuh/3.412)/(Power Input in watts – Fan Power Correction in watts + Pump Power Correction in watts) = watts/watts

NOTE: Do not divide ISO Heating Capacity by 3.412 to obtain Btuh/watts.

Refer to English to SI conversion table in this book.

b) Identify the design conditions corrected for air and water conditions.

Airflow Cfm = 700 cfm

Water Flow
(Based upon 12 F rise in temp) = 4.5 gpm

External Static Pressure = 0.4 in. wg

Water Pressure Drop = 2.1 ft of head

Power input = 1,910 watts

Cooling Capacity = 22,399 Btuh

c) Perform Fan Power Correction Adjustment

Use the following formula to calculate Fan Power Correction:

Fan Power Correction = (Cfm x 0.472) x (External Static Pressure x 249)/300 = watts
= (700 x 0.472) x (0.4 x 249)/300
= 110 watts

d) Perform Pump Power Correction Adjustment

Use the following formula to calculate Pump Power Correction:

Pump Power Correction = (GPM x 0.0631) x (Pressure Drop x 2,990)/300
= watts
= (4.5 x 0.0631) x (2.1 x 2,990)/300
= 5.94 watts

e) Perform capacity and EER calculations

Use the following formula to calculate capacity and EER:

ISO Cooling Capacity = (Cooling Capacity) + (Fan Power Correction x 3.412)
= 22,399 + (110 x 3.412)
= 22,774 Btuh

f) Perform Corrections by using the ISO Equations

ISO EER = (ISO Cooling Capacity/3.412)/(Power Input – Fan Power Correction + Pump Power Correction)
= watts/watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/watts.

= (22,774/3.412)/(1,910 – 110 + 5.94)
= 3.7 watts/watts x 3.412 Btuh/watts
= 12.62 Btuh/watts

Performance data

50RDS, RHS, RVS015

500 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	3.8	1.3	3.1	Operation Not Recommended				9.2	0.84	6.4
30	1.8	0.3	0.8	17.3	12.2	0.56	19.9	10.1	0.86	7.2
	2.8	0.8	1.8	17.5	12.2	0.53	19.9	10.6	0.87	7.6
	3.8	1.3	3.0	17.7	12.2	0.53	20.0	10.8	0.87	7.8
40	1.8	0.3	0.8	16.8	12.0	0.61	19.5	11.6	0.88	8.6
	2.8	0.7	1.7	17.2	12.2	0.57	19.6	12.2	0.89	9.1
	3.8	1.3	2.9	17.3	12.2	0.55	19.7	12.5	0.90	9.4
50	1.8	0.3	0.8	16.3	11.7	0.68	19.1	13.2	0.91	10.1
	2.8	0.7	1.7	16.7	11.9	0.62	19.2	13.9	0.91	10.8
	3.8	1.2	2.8	16.9	12.0	0.60	19.3	14.3	0.92	11.1
60	1.8	0.3	0.7	15.7	11.3	0.76	18.5	14.9	0.92	11.7
	2.8	0.7	1.6	16.1	11.6	0.70	18.6	15.7	0.93	12.5
	3.8	1.2	2.7	16.3	11.7	0.67	18.6	16.1	0.94	12.9
70	1.8	0.3	0.7	14.9	10.9	0.86	17.9	16.6	0.94	13.4
	2.8	0.7	1.5	15.5	11.2	0.79	18.0	17.5	0.95	14.3
	3.8	**1.1**	**2.7**	15.7	11.3	0.76	18.0	**18.1**	**0.96**	**14.8**
80	1.8	0.3	0.7	14.2	10.6	0.97	17.6	18.3	0.96	15.0
	2.8	0.6	1.5	14.7	10.8	0.89	17.7	19.4	0.97	16.1
	3.8	1.1	2.6	15.0	10.9	0.85	17.7	20.0	0.97	16.7
90	1.8	0.3	0.7	13.3	10.4	1.08	17.3	20.1	0.97	16.7
	2.8	0.6	1.4	13.9	10.5	1.00	17.4	21.3	0.98	18.0
	3.8	1.1	2.5	14.2	10.6	0.96	17.4	22.0	0.99	18.6
100	1.8	0.3	1.6	12.3	10.2	1.19	16.9	Operation Not Recommended		
	2.8	0.6	1.4	13.0	10.3	1.12	16.9			
	3.8	1.0	2.4	13.3	10.4	1.08	16.9			
110	1.8	0.3	1.6	11.3	10.1	1.31	16.5			
	2.8	0.6	1.3	12.0	10.2	1.24	16.4			
	3.8	1.0	2.3	12.3	10.2	1.20	16.3			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:

1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

50RDS, RHS, RVS018
600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	4.5	1.8	4.2	Operation Not Recommended				12.1	1.12	8.2
30	2.2	0.5	1.2	22.1	14.7	0.80	24.0	13.2	1.14	9.3
	3.5	1.1	2.6	22.3	14.7	0.76	24.1	13.9	1.16	9.9
	4.5	1.8	4.1	22.4	14.7	0.75	24.2	14.1	1.16	10.2
40	2.2	0.5	1.1	21.7	14.7	0.88	23.6	15.2	1.18	11.2
	3.5	1.1	2.5	22.1	14.7	0.81	23.7	16.0	1.20	11.9
	4.5	1.7	3.9	22.2	14.7	0.79	23.8	16.4	1.21	12.2
50	2.2	0.5	1.1	21.0	14.6	0.98	23.3	17.2	1.22	13.1
	3.5	1.1	2.5	21.6	14.7	0.90	23.3	18.2	1.24	14.0
	4.5	1.7	3.8	21.7	14.7	0.87	23.3	18.6	1.25	14.4
60	2.2	0.5	1.0	20.2	14.3	1.09	23.2	19.3	1.26	15.0
	3.5	1.0	2.4	20.9	14.5	1.00	23.2	20.5	1.28	16.1
	4.5	1.6	3.7	21.1	14.6	0.97	23.2	21.0	1.29	16.6
70	2.2	0.4	1.0	19.3	13.9	1.22	23.0	21.5	1.30	17.0
	3.5	1.0	2.3	20.0	14.2	1.12	23.1	22.8	1.32	18.3
	4.5	**1.5**	**3.6**	20.3	14.3	1.08	23.1	**23.4**	**1.33**	**18.8**
80	2.2	0.4	1.0	18.3	13.5	1.36	22.6	23.6	1.34	19.1
	3.5	1.0	2.2	19.1	13.8	1.25	22.6	25.1	1.36	20.5
	4.5	1.5	3.5	19.4	14.0	1.21	22.5	25.7	1.37	21.1
90	2.2	0.4	0.9	17.2	12.9	1.49	22.1	25.8	1.37	21.1
	3.5	0.9	2.1	18.0	13.3	1.39	22.1	27.4	1.40	22.6
	4.5	1.4	3.2	18.3	13.5	1.35	22.0	28.1	1.40	23.3
100	2.2	0.4	0.9	16.1	12.2	1.63	21.5	Operation Not Recommended		
	3.5	0.9	2.1	16.9	12.7	1.53	21.4			
	4.5	1.4	3.2	17.2	12.9	1.49	21.3			
110	2.2	0.4	0.9	14.9	13.5	1.77	20.9			
	3.5	0.9	2.0	15.7	12.0	1.67	20.8			
	4.5	1.3	3.1	16.1	12.2	1.63	20.7			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RDS, RHS, RVS024
800 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	6.0	1.7	3.9	Operation Not Recommended				16.2	1.59	10.8
30	3.0	0.4	0.9	30.6	21.2	0.94	33.8	19.2	1.65	13.6
	4.5	0.9	2.1	30.9	21.2	0.91	34.0	19.4	1.65	13.7
	6.0	1.6	3.8	31.1	21.2	0.87	34.1	19.5	1.65	13.9
40	3.0	0.4	0.9	29.7	20.6	1.12	33.5	21.9	1.70	16.1
	4.5	0.9	2.1	30.0	20.6	1.08	33.7	22.2	1.71	16.3
	6.0	1.6	3.8	30.2	20.6	1.04	33.8	22.5	1.72	16.6
50	3.0	0.4	0.9	28.8	20.0	1.31	33.3	24.5	1.75	18.5
	4.5	0.9	2.0	29.1	20.0	1.25	33.3	24.9	1.77	18.9
	6.0	1.6	3.6	29.3	20.0	1.20	33.4	25.4	1.79	19.3
60	3.0	0.4	0.9	27.5	19.6	1.46	32.4	27.1	1.82	20.9
	4.5	0.8	1.9	27.7	19.6	1.39	32.4	27.9	1.84	21.6
	6.0	1.5	3.5	28.0	19.7	1.32	32.5	28.7	1.87	22.3
70	3.0	0.4	0.8	26.1	19.3	1.61	31.6	29.7	1.88	23.3
	4.5	0.8	1.9	26.3	19.3	1.53	31.6	30.8	1.92	24.3
	6.0	**1.5**	**3.4**	26.6	19.4	1.44	31.5	**32.0**	**1.95**	**25.3**
80	3.0	0.3	0.8	25.4	18.5	1.81	31.6	32.4	1.95	25.7
	4.5	0.8	1.8	25.6	18.6	1.72	31.5	33.6	1.99	26.8
	6.0	1.4	3.2	25.9	18.6	1.62	31.4	34.9	2.03	28.0
90	3.0	0.3	0.8	24.7	17.7	2.01	31.6	35.0	2.01	28.1
	4.5	0.8	1.7	24.9	17.8	1.91	31.4	36.4	2.06	29.4
	6.0	1.4	3.1	25.2	17.9	1.80	31.3	37.8	2.11	30.6
100	3.0	0.3	0.7	23.3	17.2	2.26	31.0	Operation Not Recommended		
	4.5	0.7	1.7	23.6	17.3	2.14	30.9			
	6.0	1.3	3.0	23.8	17.3	2.02	30.7			
110	3.0	0.3	0.7	22.0	16.7	2.50	30.5			
	4.5	0.7	1.6	22.2	16.7	2.37	30.3			
	6.0	1.3	2.9	22.4	16.8	2.24	30.0			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

50RDS, RHS, RVS030
1000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	7.5	2.7	6.2	Operation Not Recommended				18.6	1.88	12.2
30	3.7	0.6	1.4	35.8	24.4	1.22	39.9	20.7	1.92	14.1
	5.5	1.4	3.2	35.9	24.3	1.18	40.0	21.6	1.92	15.1
	7.5	2.6	6.0	36.1	24.1	1.14	40.0	22.6	1.92	16.1
40	3.7	0.6	1.4	34.7	24.2	1.41	39.5	24.1	1.98	17.4
	5.5	1.3	3.1	34.8	24.0	1.36	39.5	24.9	1.98	18.2
	7.5	2.5	5.8	35.0	23.9	1.31	39.5	25.7	1.99	18.9
50	3.7	0.6	1.3	33.6	23.9	1.60	39.1	27.6	2.03	20.7
	5.5	1.3	3.0	33.8	23.8	1.54	39.0	28.2	2.05	21.2
	7.5	2.4	5.6	33.9	23.8	1.48	39.0	28.8	2.06	21.8
60	3.7	0.6	1.3	32.5	23.2	1.73	38.4	31.1	2.09	24.0
	5.5	1.3	2.9	32.6	23.1	1.66	38.3	32.0	2.11	24.8
	7.5	2.4	5.4	32.8	23.1	1.58	38.2	32.9	2.13	25.6
70	3.7	0.5	1.3	31.3	22.4	1.87	37.7	34.6	2.14	27.3
	5.5	1.2	2.8	31.5	22.5	1.78	37.6	35.8	2.17	28.4
	7.5	**2.3**	**5.3**	31.7	22.5	1.69	37.5	**37.0**	**2.20**	**29.5**
80	3.7	0.5	1.2	30.2	22.4	2.08	37.3	38.0	2.22	30.5
	5.5	1.2	2.7	30.4	22.4	1.98	37.2	39.1	2.25	31.4
	7.5	2.2	5.1	30.6	22.5	1.89	37.1	40.2	2.28	32.4
90	3.7	0.5	1.2	29.2	22.4	2.30	37.0	41.5	2.30	33.7
	5.5	1.1	2.6	29.4	22.4	2.19	36.8	42.5	2.33	34.5
	7.5	2.1	4.9	29.6	22.5	2.08	36.7	43.5	2.36	35.4
100	3.7	0.5	1.1	27.5	21.2	2.49	36.0	Operation Not Recommended		
	5.5	1.1	2.5	27.7	21.3	2.38	35.8			
	7.5	2.0	4.7	27.9	21.3	2.26	35.6			
110	3.7	0.5	1.1	25.8	20.1	2.69	35.0			
	5.5	1.1	2.4	26.0	20.1	2.57	34.8			
	7.5	2.0	4.5	26.2	20.2	2.44	34.5			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RDS, RHS, RVS036
1150 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	9.0	4.9	11.2	Operation Not Recommended				22.9	2.23	15.3
30	4.5	1.6	3.7	40.2	29.2	1.38	44.9	25.9	2.30	18.1
	7.0	3.2	7.3	41.0	29.5	1.33	45.5	26.3	2.31	18.4
	9.0	4.7	10.9	41.9	29.8	1.27	46.2	26.6	2.32	18.7
40	4.5	1.5	3.5	38.9	28.5	1.60	44.4	29.6	2.40	21.4
	7.0	3.1	7.1	39.8	28.8	1.54	45.0	29.9	2.40	21.7
	9.0	4.6	10.6	40.6	29.0	1.48	45.6	30.3	2.41	22.1
50	4.5	1.5	3.4	37.7	27.9	1.81	43.9	33.2	2.50	24.7
	7.0	3.0	6.9	38.5	28.1	1.75	44.5	33.6	2.50	25.1
	9.0	4.4	10.2	39.3	28.3	1.68	45.0	34.0	2.49	25.5
60	4.5	1.4	3.3	36.6	28.0	1.98	43.4	36.9	2.57	28.1
	7.0	2.9	6.7	37.4	28.1	1.91	43.9	37.5	2.58	28.7
	9.0	4.3	9.9	38.2	28.3	1.85	44.5	38.2	2.59	29.3
70	4.5	1.4	3.2	35.5	28.1	2.15	42.8	40.5	2.64	31.5
	7.0	2.8	6.5	36.3	28.2	2.08	43.4	41.4	2.67	32.3
	9.0	**4.1**	**9.6**	37.1	28.2	2.01	44.0	**42.3**	**2.69**	**33.1**
80	4.5	1.3	3.1	34.2	27.1	2.39	42.3	44.2	2.71	34.9
	7.0	2.7	6.2	35.0	27.2	2.31	42.9	45.0	2.75	35.7
	9.0	4.0	9.3	35.8	27.2	2.23	43.4	45.9	2.79	36.4
90	4.5	1.3	3.0	32.9	26.1	2.62	41.9	47.8	2.78	38.3
	7.0	2.6	5.0	33.7	26.2	2.54	42.3	48.7	2.83	39.0
	9.0	3.9	8.9	34.4	26.2	2.45	42.8	49.5	2.88	39.7
100	4.5	1.3	2.9	30.9	26.2	2.94	40.9	Operation Not Recommended		
	7.0	2.5	5.8	31.6	26.3	2.85	41.3			
	9.0	3.7	8.6	32.3	26.3	2.75	41.6			
110	4.5	1.2	2.8	28.8	26.4	3.26	39.9			
	7.0	2.4	5.6	29.5	26.4	3.16	40.2			
	9.0	3.6	8.3	30.1	26.5	3.05	40.5			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

50RDS, RHS, RVS042
1400 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	10.5	6.2	14.3	Operation Not Recommended				27.2	2.60	18.4
30	5.2	2.0	4.6	51.7	36.7	1.73	57.6	31.3	2.65	22.3
	8.0	4.7	10.9	52.1	36.8	1.68	57.9	31.9	2.67	22.8
	10.5	6.0	13.9	52.6	36.9	1.63	58.2	32.5	2.68	23.3
40	5.2	1.9	4.5	49.7	35.7	2.01	56.5	35.9	2.73	26.6
	8.0	4.6	10.6	50.1	35.8	1.94	56.7	36.9	2.77	27.4
	10.5	5.8	13.5	50.5	35.9	1.88	57.0	37.8	2.80	28.3
50	5.2	1.9	4.3	47.7	34.7	2.29	55.5	40.4	2.82	30.8
	8.0	4.4	10.2	48.1	34.8	2.21	55.6	41.8	2.87	32.0
	10.5	5.6	13.0	48.5	34.9	2.13	55.8	43.2	2.92	33.2
60	5.2	1.8	4.2	46.3	33.8	2.52	54.9	45.0	2.90	35.1
	8.0	4.3	9.9	46.6	33.9	2.42	54.9	46.4	2.94	36.3
	10.5	5.5	12.6	47.0	34.1	2.31	54.9	47.8	2.99	37.6
70	5.2	1.8	4.0	44.8	32.9	2.75	54.2	49.5	2.98	39.4
	8.0	4.1	9.6	45.2	33.1	2.63	54.1	50.9	3.02	40.6
	10.5	**5.3**	**12.2**	45.5	33.2	2.50	54.0	**52.3**	**3.07**	**41.9**
80	5.2	1.7	3.9	42.5	31.9	3.06	53.0	54.1	3.06	43.6
	8.0	4.0	9.3	42.9	32.0	2.92	52.8	55.7	3.13	45.1
	10.5	5.1	11.8	43.2	32.2	2.78	52.7	57.4	3.19	46.5
90	5.2	1.6	3.8	40.3	30.8	3.37	51.8	58.6	3.15	47.9
	8.0	3.9	8.9	40.6	31.0	3.21	51.6	60.5	3.23	49.5
	10.5	4.9	11.4	40.9	31.1	3.06	51.4	62.5	3.31	51.2
100	5.2	1.6	3.6	38.3	30.2	3.76	51.1	Operation Not Recommended		
	8.0	3.7	8.6	38.6	30.3	3.59	50.8			
	10.5	4.7	11.0	38.9	30.5	3.42	50.6			
110	5.2	1.5	3.5	36.3	29.6	4.16	50.5			
	8.0	3.6	8.3	36.6	29.7	3.97	50.1			
	10.5	4.6	10.5	36.9	29.9	3.78	49.8			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RDS, RHS, RVS048
1600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	12.0	7.6	17.6	Operation Not Recommended				31.4	2.95	21.3
30	6.0	2.5	5.8	55.5	38.9	2.00	62.3	35.7	2.98	25.5
	9.0	4.7	10.9	55.9	38.7	1.93	62.5	36.3	3.01	26.0
	12.0	7.4	17.1	56.4	38.5	1.85	62.7	36.9	3.04	26.5
40	6.0	2.4	5.6	53.9	38.2	2.30	61.7	40.2	3.07	29.7
	9.0	4.6	10.6	54.3	38.0	2.21	61.8	41.0	3.09	30.5
	12.0	7.2	16.6	54.7	37.8	2.12	61.9	41.9	3.11	31.3
50	6.0	2.3	5.4	52.3	37.5	2.59	61.1	44.7	3.15	33.9
	9.0	4.4	10.2	52.7	37.3	2.49	61.2	45.8	3.16	35.0
	12.0	7.0	16.1	53.0	37.1	2.40	61.2	46.8	3.17	36.0
60	6.0	2.3	5.2	51.3	37.2	2.83	61.0	48.7	3.24	37.6
	9.0	4.3	9.9	51.6	37.0	2.73	60.9	50.3	3.25	39.2
	12.0	6.7	15.6	52.0	36.9	2.62	60.9	52.0	3.27	40.8
70	6.0	2.2	5.1	50.3	36.9	3.07	60.8	52.6	3.32	41.3
	9.0	4.1	9.6	50.6	36.8	2.96	60.7	54.9	3.35	43.5
	12.0	**6.5**	**15.1**	50.9	36.6	2.85	60.6	**57.1**	**3.37**	**45.6**
80	6.0	2.1	4.9	48.4	36.0	3.39	60.0	56.6	3.41	45.0
	9.0	4.0	9.3	48.7	35.8	3.26	59.8	58.6	3.43	47.0
	12.0	6.3	14.6	49.0	35.7	3.14	59.7	60.7	3.44	48.9
90	6.0	2.0	4.7	46.5	35.0	3.71	59.2	60.6	3.49	48.7
	9.0	3.9	8.9	46.8	34.9	3.57	59.0	62.4	3.51	50.4
	12.0	6.1	14.0	47.1	34.8	3.43	58.8	64.2	3.52	52.2
100	6.0	2.0	4.5	44.8	34.6	4.14	59.0	Operation Not Recommended		
	9.0	3.7	8.6	45.1	34.5	3.99	58.7			
	12.0	5.9	13.5	45.4	34.4	3.84	58.4			
110	6.0	1.9	4.4	43.1	34.2	4.58	58.7			
	9.0	3.6	8.3	43.4	34.1	4.41	58.4			
	12.0	5.6	13.0	43.6	34.0	4.24	58.1			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

50RDS, RHS, RVS060
2000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	15.0	5.1	11.8	Operation Not Recommended				41.5	3.99	27.9
30	7.5	1.6	3.6	68.0	46.8	2.73	77.4	43.8	4.05	30.0
	11.3	3.1	7.1	68.2	46.4	2.68	77.4	46.1	4.09	32.2
	15.0	4.9	11.4	68.4	46.1	2.63	77.4	48.5	4.13	34.4
40	7.5	1.5	3.5	65.8	46.1	3.15	76.5	51.3	4.25	36.8
	11.3	3.0	6.9	66.0	45.8	3.07	76.5	53.3	4.28	38.7
	15.0	4.8	11.1	66.3	45.5	2.99	76.5	55.3	4.32	40.6
50	7.5	1.5	3.4	63.5	45.5	3.58	75.7	58.7	4.44	43.5
	11.3	2.9	6.7	63.8	45.2	3.47	75.6	60.4	4.48	45.2
	15.0	4.6	10.7	64.1	44.8	3.36	75.5	62.2	4.51	46.8
60	7.5	1.4	3.3	62.6	45.3	3.90	75.9	66.1	4.64	50.3
	11.3	2.8	6.5	62.9	44.9	3.74	75.7	68.5	4.67	52.6
	15.0	4.5	10.4	63.2	44.6	3.58	75.4	71.0	4.71	54.9
70	7.5	1.4	3.2	61.7	45.0	4.23	76.1	73.5	4.83	57.0
	11.3	2.7	6.3	62.0	44.7	4.02	75.7	76.6	4.87	60.0
	15.0	**4.3**	**10.0**	62.4	44.3	3.80	75.4	**79.7**	**4.90**	**63.0**
80	7.5	1.3	3.1	58.7	44.2	4.70	74.8	80.9	5.03	63.7
	11.3	2.6	6.1	59.2	43.8	4.46	74.4	83.8	5.05	66.6
	15.0	4.2	9.7	59.7	43.5	4.22	74.1	86.7	5.07	69.4
90	7.5	1.3	3.0	55.8	43.4	5.17	73.4	88.3	5.23	70.5
	11.3	2.5	5.9	56.4	43.0	4.90	73.1	91.0	5.24	73.1
	15.0	4.1	9.4	56.9	42.7	4.64	72.8	93.7	5.25	75.8
100	7.5	1.2	2.9	54.4	42.9	5.72	73.9	Operation Not Recommended		
	11.3	2.4	5.6	54.8	42.6	5.43	73.3			
	15.0	3.9	9.0	55.3	42.2	5.14	72.8			
110	7.5	1.2	2.8	52.9	42.5	6.28	74.4			
	11.3	2.4	5.4	53.3	42.1	5.96	73.6			
	15.0	3.8	8.7	53.6	41.8	5.64	72.8			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RDS, RHS, RVS070
2300 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	18.0	6.9	15.9	Operation Not Recommended				45.7	4.51	30.3
30	9.0	2.1	4.9	75.8	55.5	3.30	87.1	48.3	4.47	33.1
	13.5	4.2	9.6	76.2	54.8	3.17	87.0	50.8	4.52	35.4
	18.0	6.7	15.4	76.6	54.1	3.04	86.9	53.3	4.58	37.7
40	9.0	2.1	4.8	73.4	54.2	3.76	86.3	56.0	4.64	40.2
	13.5	4.0	9.3	73.8	53.5	3.61	86.1	58.1	4.67	42.2
	18.0	6.5	15.0	74.2	52.9	3.46	86.0	60.3	4.71	44.2
50	9.0	2.0	4.6	71.1	52.9	4.23	85.5	63.6	4.81	47.3
	13.5	3.9	9.0	71.4	52.3	4.06	85.3	65.4	4.83	49.0
	18.0	6.3	14.5	71.8	51.7	3.89	85.1	67.2	4.85	50.7
60	9.0	1.9	4.5	70.2	52.1	4.62	86.0	71.3	4.98	54.3
	13.5	3.8	8.7	70.7	51.9	4.43	85.8	73.2	5.02	56.0
	18.0	6.1	14.0	71.2	51.6	4.25	85.7	75.0	5.07	57.7
70	9.0	1.9	4.3	69.3	51.3	5.02	86.4	79.0	5.15	61.4
	13.5	3.7	8.4	70.0	51.4	4.81	86.4	80.9	5.22	63.1
	18.0	**5.9**	**13.6**	70.7	51.6	4.61	86.4	**82.8**	**5.29**	**64.8**
80	9.0	1.8	4.2	66.2	49.6	5.51	85.0	86.4	5.40	68.0
	13.5	3.5	8.2	66.9	49.8	5.28	84.9	87.6	5.42	69.1
	18.0	5.7	13.1	67.6	50.0	5.06	84.8	88.8	5.45	70.2
90	9.0	1.7	4.0	63.2	48.0	6.00	83.6	93.9	5.65	74.6
	13.5	3.4	7.9	63.8	48.2	5.76	83.4	94.3	5.63	75.1
	18.0	5.5	12.7	64.4	48.3	5.51	83.2	94.8	5.61	75.6
100	9.0	1.7	3.9	60.4	47.4	6.68	83.2	Operation Not Recommended		
	13.5	3.3	7.6	61.0	47.6	6.40	82.9			
	18.0	5.3	12.2	61.6	47.7	6.13	82.6			
110	9.0	1.6	3.7	57.7	46.8	7.35	82.8			
	13.5	3.2	7.3	58.3	46.9	7.05	82.3			
	18.0	5.1	11.7	58.9	47.1	6.75	81.9			

LEGEND

EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 40 F EWT is based upon 15% antifreeze solution.
6. See Correction Factors tables for operating conditions other than those listed above.
7. Performance capacities shown in thousands of Btuh.

CORRECTION FACTORS — NOMINAL CFM — 50RDS, RHS, RVS UNITS

AIRFLOW		HEATING			COOLING			
Cfm Per Nominal (ton)	% of Nominal	TC	kW	THA	TC	TSC	kW	THR
300	75%	0.968	1.091	0.936	0.914	0.834	0.987	0.929
325	81%	0.976	1.068	0.952	0.936	0.876	0.990	0.946
350	88%	0.984	1.045	0.968	0.957	0.917	0.994	0.964
375	94%	0.992	1.023	0.984	0.979	0.959	0.997	0.982
400	**100%**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106%	1.008	0.977	1.016	1.021	1.041	1.003	1.018
450	113%	1.016	0.955	1.032	1.043	1.083	1.006	1.036

NOTE: 400 cfm is nominal airflow.

CORRECTION FACTORS — ENTERING AIR — 50RDS, RHS, RVS UNITS

HEATING				COOLING									
EAT DB (F)	TC	kW	THA	EAT WB (F)	TC	Sensible Capacity Entering Dry Bulb (F)							kW	THR
						70	75	80	80.6	85	90	95		
60	1.019	0.896	1.054	**60**	0.881	0.943	1.067	1.192	1.240	*	*	*	0.983	0.899
65	1.010	0.948	1.028	**65**	0.940	0.797	0.952	1.106	1.125	1.261	*	*	0.991	0.949
68	1.004	0.980	1.011	**66.2**	0.976	0.693	0.868	1.043	1.063	1.217	*	*	0.997	0.980
70	**1.000**	**1.000**	**1.000**	**67**	**1.000**	0.624	0.812	**1.000**	1.023	1.188	1.343	1.352	**1.000**	**1.000**
75	0.997	1.059	0.979	**70**	1.012	—	0.697	0.820	0.835	0.944	1.067	1.257	1.002	1.010
80	0.993	1.118	0.957	**75**	1.024	—	—	0.637	0.658	0.817	0.983	1.159	1.005	1.019

*Sensible capacity equals total capacity.

NOTES:
1. ARI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling — 80.6 F db/66.2 F wb and Heating — 68 F db/59 F wb.
2. Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db (bold print for comparison only).

CONVERSION TABLE – ENGLISH TO SI

MEASUREMENT	CONVERSION
Airflow	Airflow (lps) = Cfm x 0.472
Water Flow	Water flow (lps) = Gpm x 0.0631
External Static Pressure	ESP (Pascal) = ESP (in. wg) x 249
Water Pressure Drop	PD (Pascal) = PD (ft of head) x 2,990

LEGEND

ARI — Air Conditioning and Refrigeration Institute
db — Dry Bulb
EAT — Entering-Air Temperature (F)
ESP — External Static Pressure
kW — Total Power Input (kilowatts)
PD — Pressure Drop
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection
TSC — Total Sensible Capacity
wb — Wet Bulb

Performance data (cont)

50RDS, RHS, RVS BLOWER PERFORMANCE

50RDS, RHS, RVS UNIT	RATED AIRFLOW	FAN SPEED	AIRFLOW (Cfm) External Static Pressure (in. wg)															
			0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.00
015	**500**	H	880	860	840	830	820	800	780	750	730	690	660	610	—	—	—	—
		M	770	760	750	740	720	710	690	670	640	620	600	520	—	—	—	—
		L	660	660	660	650	640	630	620	600	580	550	520	460	—	—	—	—
018	**600**	H	880	860	840	830	820	800	780	750	730	690	660	610	—	—	—	—
		M	770	760	750	740	720	710	690	670	640	620	600	520	—	—	—	—
		L	660	660	660	650	640	630	620	600	580	550	520	460	—	—	—	—
024	**800**	H	1130	1110	1090	1060	1040	1010	980	950	920	880	840	720	—	—	—	—
		M	950	940	930	920	910	880	860	820	790	760	730	—	—	—	—	—
		L	880	870	860	840	830	810	800	770	730	700	660	—	—	—	—	—
030	**1000**	H	1260	1230	1200	1180	1160	1120	1090	1050	1000	970	930	850	—	—	—	—
		M	1180	1150	1120	1090	1070	1030	1000	970	950	910	870	—	—	—	—	—
		L	1040	1020	1000	980	960	930	910	870	840	820	790	—	—	—	—	—
Hi Static 030	**1000**	HS Hi	1400	1360	1320	1280	1250	1220	1200	1150	1110	1070	1020	940	850	—	—	—
		HS Med	1260	1240	1220	1190	1170	1130	1100	1070	1040	990	950	—	—	—	—	—
		HS Low	1170	1150	1130	1100	1080	1050	1020	990	960	930	900	—	—	—	—	—
036	**1150**	H	1400	1360	1320	1280	1250	1220	1200	1150	1110	1070	1020	940	—	—	—	—
		M	1260	1240	1220	1190	1170	1130	1100	1070	1040	990	950	—	—	—	—	—
		L	1170	1150	1130	1100	1080	1050	1020	990	960	930	900	—	—	—	—	—
Hi Static 036	**1150**	HS Hi	1790	1760	1730	1700	1660	1630	1590	1550	1510	1470	1440	1370	1270	1120	—	—
		HS Med	1510	1490	1470	1450	1420	1400	1380	1350	1320	1300	1270	1180	1070	—	—	—
		HS Low	1110	1100	1090	1080	1060	1050	1040	—	—	—	—	—	—	—	—	—
042	**1400**	H	—	—	—	1670	1630	1600	1570	1540	1510	1440	1380	1290	1130	—	—	—
		M	1610	1580	1550	1510	1480	1450	1420	1390	1360	1320	1270	—	—	—	—	—
		L	1270	1260	1250	1240	1220	1210	1190	1160	1120	1080	—	—	—	—	—	—
048	**1600**	H	—	—	—	2010	2000	1940	1880	1830	1780	1690	1610	1540	1310	—	—	—
		M	1950	1910	1870	1820	1780	1740	1700	1670	1630	1570	1520	1410	1310	—	—	—
		L	1470	1460	1450	1440	1430	1410	1380	1360	1330	1280	1220	—	—	—	—	—
060	**2000**	H	—	—	—	—	—	2270	2230	2200	2170	2140	2110	2040	1970	1870	1720	1640
		M	2260	2240	2220	2190	2170	2140	2110	2100	2080	2050	2020	1960	1870	1760	1660	1550
		L	2050	2030	2010	1990	1970	1950	1930	1910	1880	1850	1830	1780	1700	1650	1570	—
070	**2300**	H	—	—	—	—	—	2460	2430	2390	2340	2310	2280	2230	2180	1990	1860	1740
		M	2530	2500	2470	2450	2420	2400	2370	2340	2310	2280	2260	2200	2100	1890	1740	—
		L	2270	2260	2250	2240	2230	2210	2180	2160	2140	2120	2100	2040	1900	1790	—	—

LEGEND

— — Not Recommended

NOTES:
1. Includes allowance for wet coil and clean factory-installed filter.
2. Factory settings are indicated in **bold** print.
3. Units factory shipped on medium speed (size 015 on Low). Other speeds require field selection.
4. All airflow is rated on 208-v operating with wet coil and clean air filter.
5. All units ARI/ISO/ASHRAE 13256-1 rated on high (size 015 rated on medium).

50RDS,RHS,RVS UNIT BLOWER PERFORMANCE WITH HWR

COIL FACE VELOCITY (FPM)	50RDS,RHS,RVS UNIT WITH REHEAT ESP LOSS					
	015, 018 (in. wg)	024, 030 (in. wg)	036 (in. wg)	042, 048 (in. wg)	060 (in. wg)	070 (in. wg)
200	0.040	0.037	0.033	0.031	0.028	0.026
250	0.059	0.052	0.046	0.042	0.038	0.034
300	0.088	0.077	0.066	0.059	0.051	0.044
350	0.131	0.113	0.096	0.085	0.073	0.061
400	0.203	0.181	0.160	0.145	0.131	0.117
450	0.258	0.242	0.226	0.215	0.205	0.194
500	0.375	0.360	0.345	0.335	0.326	0.316

LEGEND

ESP — External Static Pressure
HWR — Hot Water Reheat

Performance data (cont)

50RDS, RHS, RVS UNITS
RADIATED SOUND POWER DATA

UNIT 50RDS, RHS, RVS	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
015	FAN ONLY	LOW	63.1	53.3	52.0	47.5	47.0	41.5	30.0
		HIGH	66.1	59.7	55.0	52.5	50.5	46.0	34.3
	COOLING	LOW	63.0	59.0	56.0	50.5	48.0	42.8	40.0
		HIGH	65.2	60.9	57.0	51.7	49.0	43.6	40.8
	HEATING	LOW	66.0	61.5	57.5	51.7	48.7	43.5	41.0
		HIGH	68.2	63.4	58.5	52.9	49.7	44.3	38.3
018	FAN ONLY	LOW	64.1	54.3	53.0	48.5	48.0	42.0	30.5
		HIGH	68.6	61.0	56.0	54.0	52.0	47.5	35.0
	COOLING	LOW	64.0	59.5	53.0	51.0	49.5	43.8	41.0
		HIGH	66.8	61.5	54.0	52.4	50.7	45.0	41.9
	HEATING	LOW	67.0	62.0	54.5	52.2	50.2	44.5	42.0
		HIGH	69.8	64.0	55.5	53.6	51.4	45.7	39.4
024	FAN ONLY	LOW	65.1	55.8	53.0	48.5	50.0	43.5	31.5
		HIGH	70.1	63.0	56.5	55.0	53.0	49.5	36.5
	COOLING	LOW	62.5	56.3	51.8	50.3	50.0	45.3	39.4
		HIGH	69.3	61.5	53.0	50.6	50.4	44.2	40.0
	HEATING	LOW	65.5	58.8	53.6	51.5	50.7	46.0	40.4
		HIGH	72.3	64.0	54.8	51.8	51.1	44.9	37.5
030	FAN ONLY	LOW	69.6	59.3	56.0	53.0	55.0	52.0	39.0
		HIGH	74.6	64.0	58.0	58.5	57.5	57.0	46.0
	COOLING	LOW	65.5	58.0	53.8	52.8	54.0	51.3	40.5
		HIGH	71.8	63.7	55.1	54.2	55.7	52.1	44.9
	HEATING	LOW	68.0	59.5	54.8	53.3	54.0	50.8	41.0
		HIGH	74.3	65.2	56.1	54.7	55.7	51.6	41.9
036	FAN ONLY	LOW	69.1	58.8	56.0	52.5	54.5	49.5	38.0
		HIGH	73.6	67.0	60.5	60.0	57.5	57.0	46.0
	COOLING	LOW	68.0	59.5	57.3	52.3	52.0	49.3	42.0
		HIGH	74.1	64.5	58.5	52.5	52.1	48.1	43.1
	HEATING	LOW	70.5	61.0	58.3	52.8	52.0	48.8	42.5
		HIGH	76.6	66.0	59.5	53.0	52.1	47.6	40.1
042	FAN ONLY	LOW	63.1	55.8	53.3	48.8	46.0	41.3	30.0
		HIGH	74.6	68.5	61.8	59.0	56.5	53.8	43.0
	COOLING	LOW	69.5	61.0	54.3	51.8	48.0	43.8	40.5
		HIGH	78.3	68.4	57.5	54.5	52.0	46.9	45.5
	HEATING	LOW	72.0	62.5	55.3	52.3	48.0	43.3	41.0
		HIGH	80.8	67.7	56.9	53.0	49.5	43.2	39.5
048	FAN ONLY	LOW	64.1	56.8	54.8	49.8	47.0	42.3	31.0
		HIGH	76.1	70.0	63.3	60.5	58.0	55.8	44.5
	COOLING	LOW	70.5	61.8	55.3	52.6	50.0	46.3	42.0
		HIGH	79.4	67.1	56.9	53.4	51.6	46.4	44.1
	HEATING	LOW	73.0	63.3	56.3	53.1	50.0	45.8	42.5
		HIGH	81.9	68.6	57.9	53.9	51.6	45.9	41.1
060	FAN ONLY	LOW	79.6	68.8	62.8	59.3	62.0	60.8	48.0
		HIGH	82.1	74.0	65.8	62.0	63.0	60.8	50.0
	COOLING	LOW	68.5	66.5	61.3	60.3	60.0	58.8	48.5
		HIGH	75.5	70.2	61.8	59.5	59.6	56.2	48.3
	HEATING	LOW	71.0	68.0	62.3	60.8	60.0	58.3	49.0
		HIGH	78.0	71.7	62.8	60.0	59.6	55.7	45.3

NOTES:
1. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI Standard 260-2000.
2. Data is not available for 50RDS, RHS, RVS070 units.
3. Ratings for medium speed can be obtained through interpolation.
4. All performance is Sound Power Level in dB referenced to 1 picoWatt.

50RDS, RHS, RVS UNITS WITH MUTE PACKAGE OPTION

RADIATED SOUND POWER DATA

UNIT 50RDS, RHS, RVS	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
015	FAN ONLY	LOW	62.6	53.8	50.5	46.0	44.0	39.0	30.0
		HIGH	65.6	57.7	52.5	48.5	46.0	41.0	31.3
	COOLING	LOW	61.5	56.0	54.5	48.0	45.0	38.8	35.0
		HIGH	63.2	58.4	56.0	48.7	45.5	40.1	36.3
	HEATING	LOW	64.5	58.5	56.0	49.2	45.7	39.5	36.0
		HIGH	66.2	60.9	57.5	49.9	46.2	40.8	37.3
018	FAN ONLY	LOW	63.6	54.8	51.5	47.0	45.0	39.5	30.5
		HIGH	68.1	59.0	53.5	50.0	47.5	42.5	32.0
	COOLING	LOW	62.5	56.5	51.5	48.5	46.5	39.8	36.0
		HIGH	64.8	59.0	53.0	49.4	47.2	41.5	37.4
	HEATING	LOW	65.5	59.0	53.0	49.7	47.2	40.5	37.0
		HIGH	67.8	61.5	54.5	50.6	47.9	42.2	38.4
024	FAN ONLY	LOW	64.6	56.3	51.5	47.0	47.0	41.0	31.5
		HIGH	69.6	61.0	54.0	51.0	48.5	44.5	33.5
	COOLING	LOW	61.0	53.3	50.3	47.8	47.0	41.3	34.4
		HIGH	67.3	59.0	52.0	47.6	46.9	40.7	35.5
	HEATING	LOW	64.0	55.8	52.1	49.0	47.7	42.0	35.4
		HIGH	70.3	61.5	53.8	48.8	47.6	41.4	36.5
030	FAN ONLY	LOW	69.1	59.8	54.5	51.5	52.0	49.5	39.0
		HIGH	74.1	62.0	55.5	54.5	53.0	52.0	43.0
	COOLING	LOW	64.0	55.0	52.3	50.3	51.0	47.3	35.5
		HIGH	69.8	61.2	54.1	51.2	52.2	48.6	40.4
	HEATING	LOW	66.5	56.5	53.3	50.8	51.0	46.8	36.0
		HIGH	72.3	62.7	55.1	51.7	52.2	48.1	40.9
036	FAN ONLY	LOW	68.6	59.3	54.5	51.0	51.5	47.0	38.0
		HIGH	73.1	65.0	58.0	56.0	53.0	52.0	43.0
	COOLING	LOW	66.5	56.5	55.8	49.8	49.0	45.3	37.0
		HIGH	72.1	62.0	57.5	49.5	48.6	44.6	38.6
	HEATING	LOW	69.0	58.0	56.8	50.3	49.0	44.8	37.5
		HIGH	74.6	63.5	58.5	50.0	48.6	44.1	39.1
042	FAN ONLY	LOW	62.6	56.3	51.8	47.3	43.0	38.8	30.0
		HIGH	74.1	66.5	59.3	55.0	52.0	48.8	40.0
	COOLING	LOW	68.0	58.0	52.8	49.3	45.0	39.8	35.5
		HIGH	76.3	65.9	56.5	51.5	48.5	43.4	41.0
	HEATING	LOW	70.5	59.5	53.8	49.8	45.0	39.3	36.0
		HIGH	78.8	65.2	55.9	50.0	46.0	39.7	38.5
048	FAN ONLY	LOW	63.6	57.3	53.3	48.3	44.0	39.8	31.0
		HIGH	75.6	68.0	60.8	56.5	53.5	50.8	41.5
	COOLING	LOW	69.0	58.8	53.8	50.1	47.0	42.3	37.0
		HIGH	77.4	64.6	55.9	50.4	48.1	42.9	39.6
	HEATING	LOW	71.5	60.3	54.8	50.6	47.0	41.8	37.5
		HIGH	79.9	66.1	56.9	50.9	48.1	42.4	40.1
060	FAN ONLY	LOW	79.1	69.3	61.3	57.8	59.0	58.3	48.0
		HIGH	81.6	72.0	63.3	58.0	58.5	55.8	47.0
	COOLING	LOW	67.0	63.5	59.8	57.8	57.0	54.8	43.5
		HIGH	73.5	67.7	60.8	56.5	56.1	52.7	43.8
	HEATING	LOW	69.5	65.0	60.8	58.3	57.0	54.3	44.0
		HIGH	76.0	69.2	61.8	57.0	56.1	52.2	44.3

NOTES:
1. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI Standard 260-2000.
2. Data is not available for 50RDS, RHS, RVS070 units.
3. Ratings for medium speed can be obtained through interpolation.
4. All performance is Sound Power Level in dB referenced to 1 picoWatt.

Electrical data

50RDS, RHS, RVS ELECTRICAL DATA

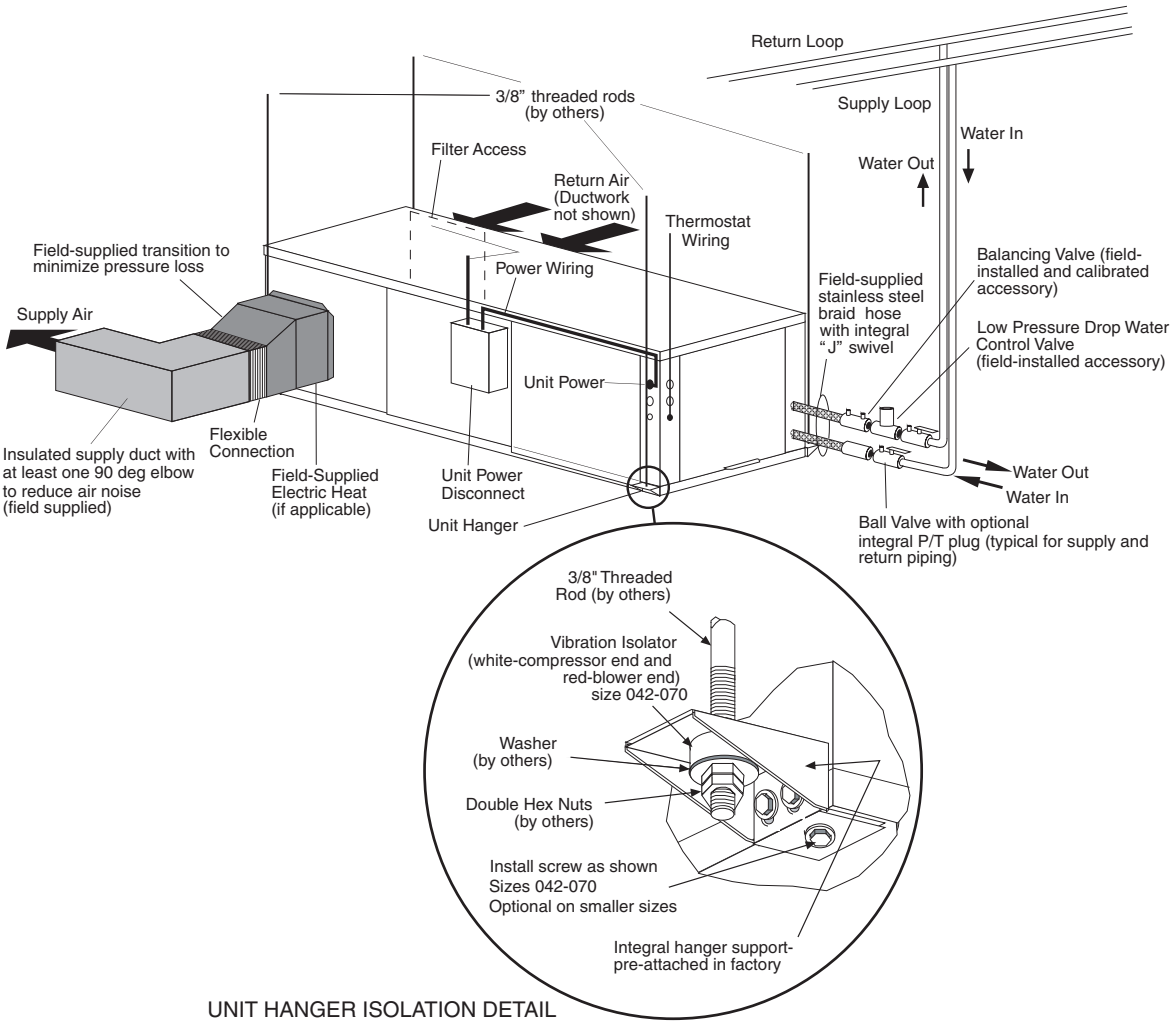
50RDS, RHS, RVS UNIT	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR	UNITS WITH HWR			
			RLA	LRA					REHEAT PUMP FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/ HACR
015	208/230-1	197/254	4.9	26.3	1.0	7.1	8.6	15	0.8	6.7	7.9	15
	265-1	239/292	4.4	28.0	0.9	5.7	6.9	15	0.7	8.0	7.1	15
018	208/230-1	197/254	7.1	38.0	1.0	8.7	10.6	15	0.8	8.9	10.7	15
	265-1	239/292	5.5	32.0	0.9	6.7	8.2	15	0.7	7.1	8.5	15
024	208/230-1	197/254	10.9	54.0	1.1	11.4	14.0	20	0.8	12.8	15.5	25
	265-1	239/292	9.0	55.0	0.9	9.6	11.8	20	0.7	10.6	12.9	20
	208/230-3	197/254	7.1	45.0	1.1	8.2	10.0	15	0.8	9.0	10.8	20
	460-3	414/506	3.5	22.4	0.6	4.1	5.0	15	0.7	4.8	5.7	15
030	208/230-1	197/254	12.2	67.0	1.3	13.5	16.6	25	0.8	14.3	17.4	25
	265-1	239/292	10.9	56.0	1.6	12.5	15.2	25	0.7	13.2	15.9	25
	208/230-3	197/254	7.7	55.0	1.3	9.0	10.9	15	0.8	9.8	11.7	15
	460-3	414/506	3.8	27.0	0.9	4.7	5.7	15	0.7	5.4	6.4	15
030 HIGH STATIC	208/230-1	197/254	12.2	67.0	1.8	14.0	17.1	25	—	—	—	—
	265-1	239/292	10.9	56.0	2.0	12.9	15.6	25	—	—	—	—
	208/230-3	197/254	7.7	55.0	1.8	9.5	11.4	15	—	—	—	—
	460-3	414/506	3.8	27.0	1.3	5.1	6.1	15	—	—	—	—
036	208/230-1	197/254	13.5	73.0	1.8	15.3	18.7	30	0.8	16.1	19.5	30
	265-1	239/292	12.8	71.0	2.0	14.8	18.0	30	0.7	15.5	18.7	30
	208/230-3	197/254	9.6	63.0	1.8	11.4	13.8	20	0.8	12.2	14.6	20
	460-3	414/506	4.5	31.0	1.3	5.8	6.9	15	0.7	6.5	7.6	15
036 HIGH STATIC	208/230-1	197/254	13.5	73.0	1.8	16.5	19.9	30	—	—	—	—
	208/230-3	197/254	9.6	63.0	1.8	12.6	15.0	20	—	—	—	—
	460-3	414/506	4.5	31.0	1.3	6.2	7.3	15	—	—	—	—
042	208/230-1	197/254	16.5	95.0	1.9	18.4	22.5	35	0.8	19.2	23.3	35
	208/230-3	197/254	10.3	77.0	1.9	12.2	14.8	25	0.8	13.0	15.6	25
	460-3	414/506	5.1	39.0	1.0	6.1	7.4	15	0.7	6.8	8.1	15
	575-3	518/633	4.2	31.0	0.8	5.0	6.1	15	N/A	N/A	N/A	N/A
048	208/230-1	197/254	18.3	109.0	3.0	21.3	25.9	40	1.07	22.4	26.9	45
	208/230-3	197/254	12.4	88.0	3.0	15.4	18.5	30	1.07	16.5	19.6	30
	460-3	414/506	6.4	44.0	1.7	8.1	9.7	15	1.07	9.2	10.8	15
	575-3	518/633	4.8	34.0	1.4	6.2	7.4	15	N/A	N/A	N/A	N/A
060	208/230-1	197/254	25.0	169.0	3.4	28.4	34.7	50	1.07	29.5	35.7	60
	208/230-3	197/254	17.3	123.0	3.4	20.7	25.0	40	1.07	21.8	26.1	40
	460-3	414/506	6.7	49.5	1.8	8.5	10.2	15	1.07	9.6	11.2	15
	575-3	518/633	5.8	40.0	1.4	7.2	8.7	15	N/A	N/A	N/A	N/A
070	208/230-1	197/254	28.8	169.0	4.9	33.7	40.9	60	1.07	34.8	42.0	70
	208/230-3	197/254	17.3	137.0	4.9	22.2	26.5	40	1.07	23.3	27.6	40
	460-3	414/506	9.0	62.0	2.5	11.5	13.8	20	1.07	12.6	14.8	20
	575-3	518/633	6.6	49.0	1.9	8.5	10.2	15	N/A	N/A	N/A	N/A

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
HWR — Hot Water Reheat
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Typical piping and wiring

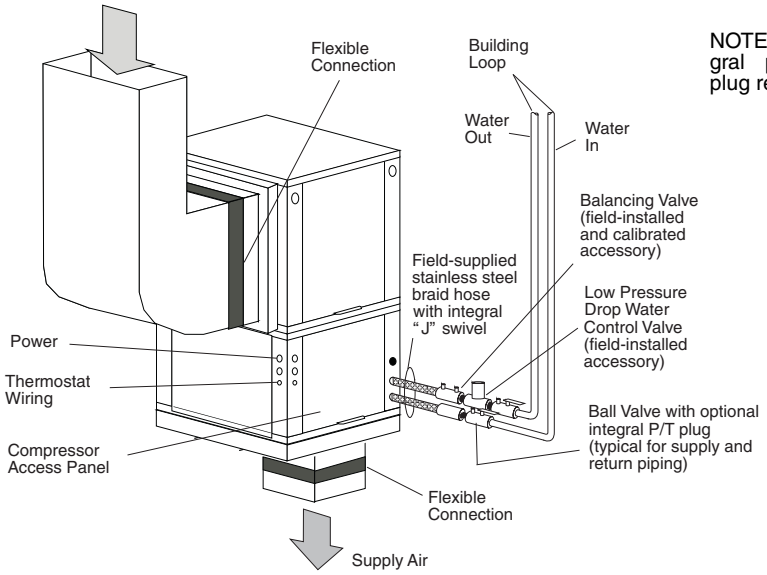
TYPICAL INSTALLATION — 50RHS UNITS



UNIT HANGER ISOLATION DETAIL

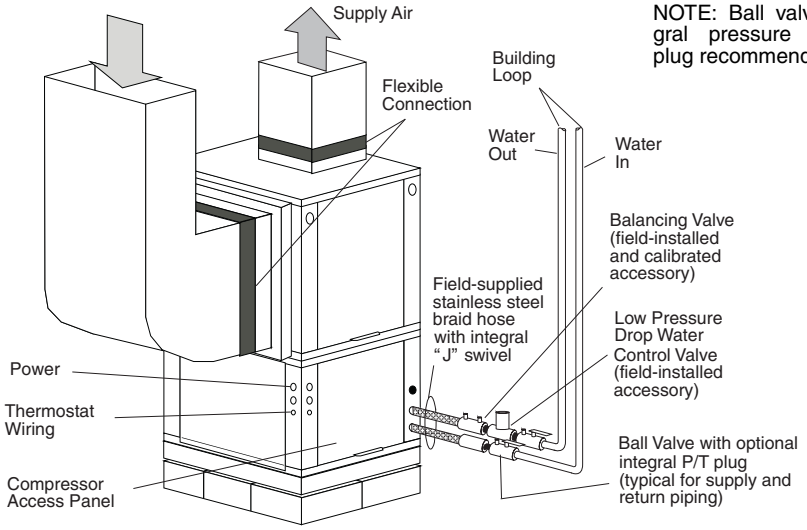
Typical piping and wiring (cont)

TYPICAL DOWNFLOW INSTALLATION — 50RDS UNITS



NOTE: Ball valve with integral pressure temperature plug recommended.

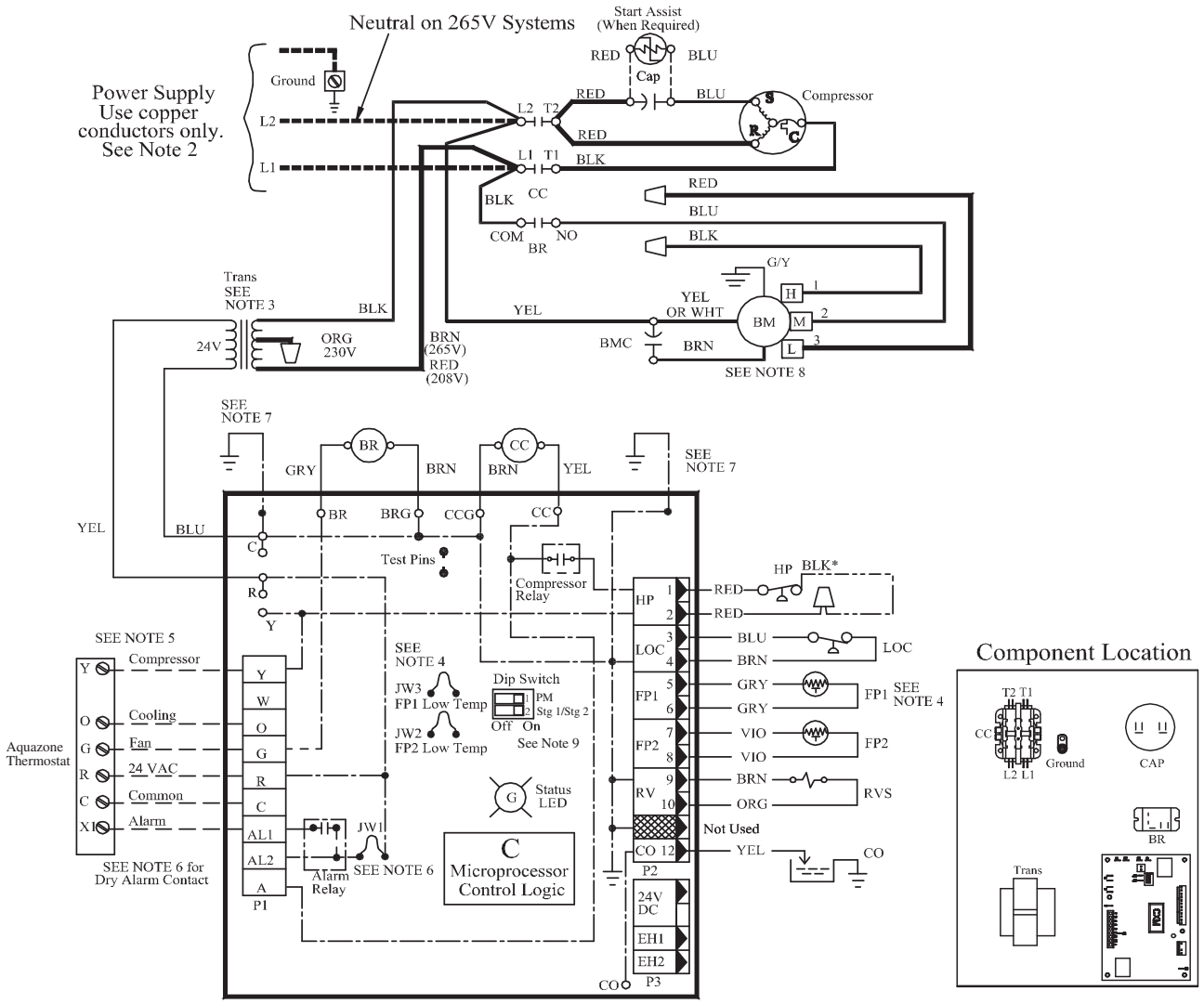
TYPICAL VERTICAL INSTALLATION — 50RVS UNITS



NOTE: Ball valve with integral pressure temperature plug recommended.

Typical control wiring schematics

TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING



LEGEND

AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Capacitor
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
JW1 — Jumper, Alarm
LOC — Loss of Charge Pressure Switch

*Optional wiring.

NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
Trans — Transformer

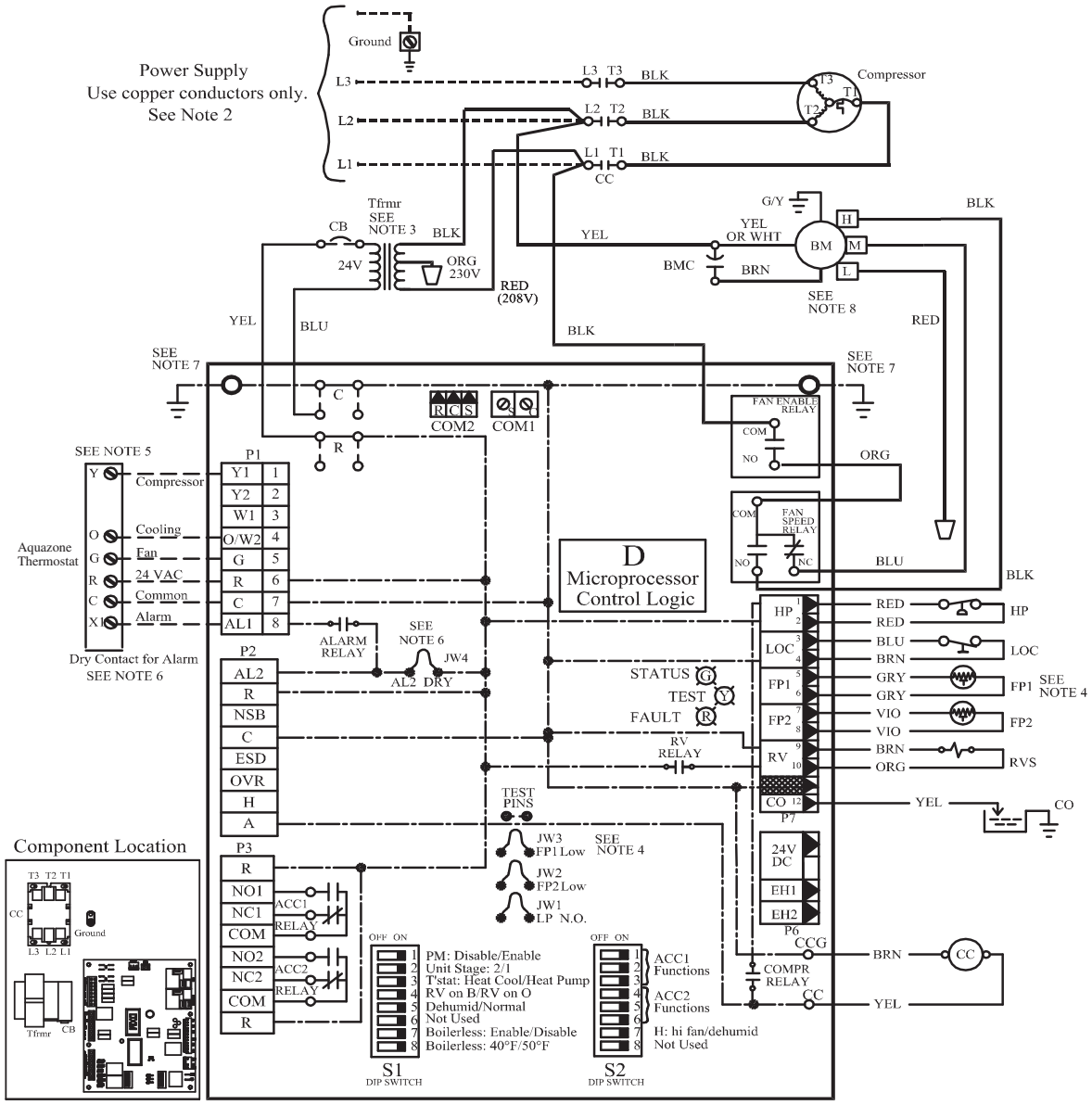
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil

Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 265 v (BRN) lead for 265/1/60 units, or 208 v (RED) lead for 208/1/60. For 230/1/60 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. For high or low speed remove BLU wire from BR 'NO' and replace with BLK or RED wire respectively. Tape off unused terminal.
9. Both DIP switches need to be in the ON position.

Typical control wiring schematics (cont)

TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING



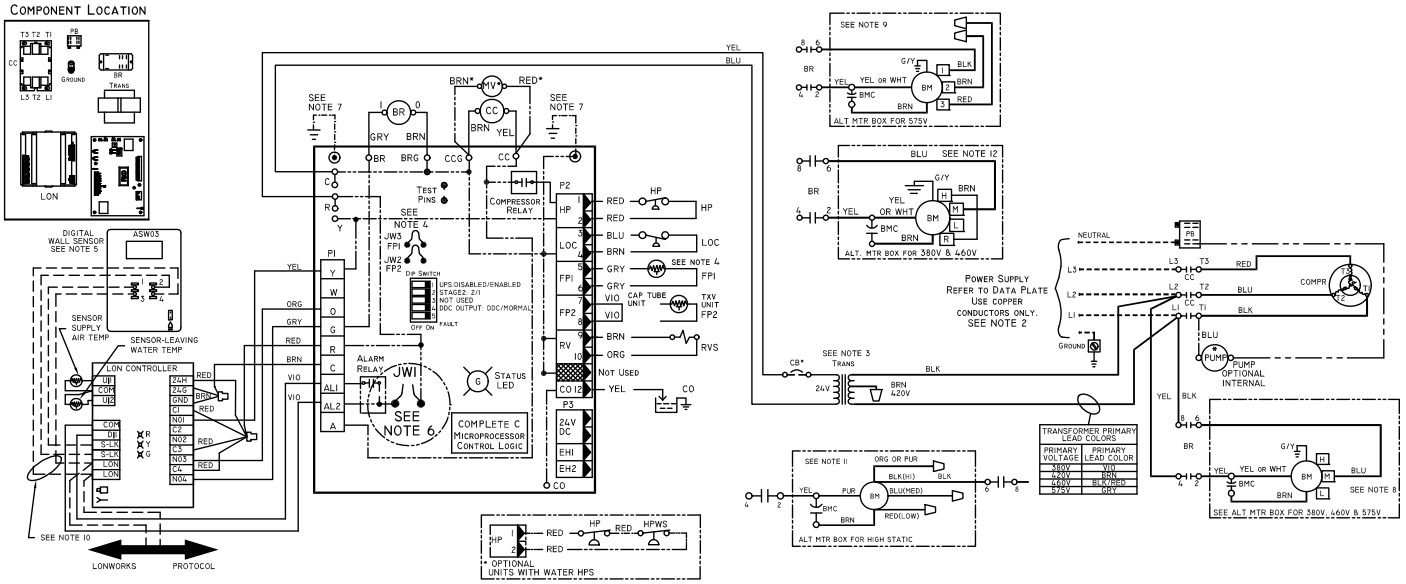
LEGEND

AL	— Alarm Relay Contacts	**LOC**	— Loss of Charge Pressure Switch
BM	— Blower Motor	**NEC**	— National Electrical Code
BMC	— Blower Motor Capacitor	**P1**	— Field Wiring Terminal Block
CB	— Circuit Breaker	**PM**	— Performance Monitor
CC	— Compressor Contactor	**RVS**	— Reversing Valve Solenoid
CO	— Sensor, Condensate Overflow	**Tfrmr**	— Transformer
FP1	— Sensor, Water Coil Freeze Protection		Field Line Voltage Wiring
FP2	— Sensor, Air Coil Freeze Protection		Field Low Voltage Wiring
HP	— High-Pressure Switch		Printed Circuit Trace
JW1	— Jumper, Alarm		

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 208 v (RED) lead for 208/3/60. For 230/3/60 switch RED and ORG leads at L1 and insulate RED lead.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, attach the lower speed wire to fan speed relay N.O. wire.

TYPICAL AQUAZONE™ UNIT WITH COMPLETE C AND LON CONTROLLER, THREE-PHASE (460/575 V)



LEGEND

AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
COMPR — Compressor
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
HPWS — High-Pressure Water Switch
JW1 — Clippable Field Selection Jumper
LOC — Loss of Charge Pressure Switch
LON — Local Operating Network
MV — Motorized Valve
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PB — Power Block
RVS — Reversing Valve Solenoid
TRANS — Transformer
TXV — Thermostatic Expansion Valve
*Optional Wiring.

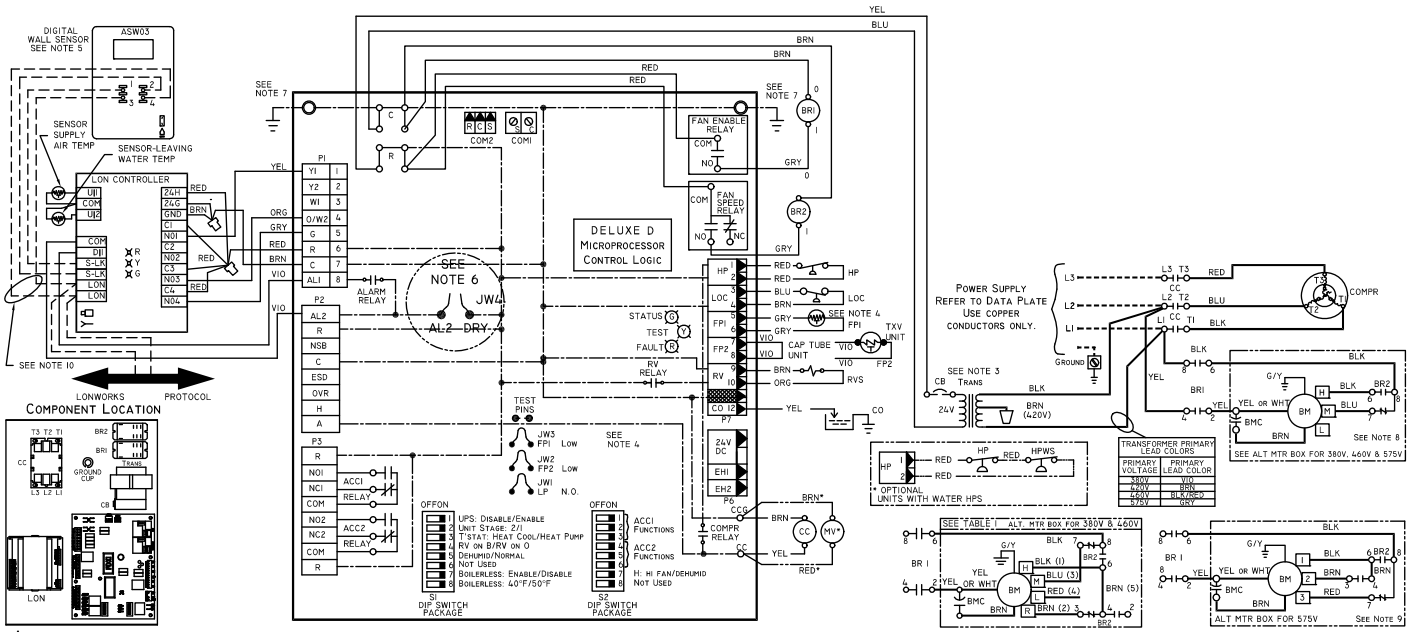
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground

Wire Nut
Relay Contacts - N.C.
Relay Contacts - N.O.
Low Pressure Switch
High Pressure Switch
Splice Cap
Circuit Breaker

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 460 v (BLK/RED) lead for 460/3/60 units, 575 v (GRY) lead for 575/3/60 units, or 380 v (VIO) lead for 380/3/50 units. For 420/3/50 operation, switch VIO and BRN leads at L1 and insulate VIO lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. Factory cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Fan motors are factory wired for medium speed. For high or low speed, remove BLU wire from fan motor speed tap “M” and connect to “H” for high speed or “L” for low speed.
9. For low speed, remove BLK wire from BR “6” and replace with RED. Connect BLK and BRN wires together.
10. Optional LON wires. Only connect if LON connection is desired at the wall sensor.
11. For blower motors with leads. For medium or low speed, disconnect BLK wire from BR “6”. Connect BLK and ORG/PUR wire together. Connect RED for low or BLU for medium to BR “6”.
12. Blower motor is factory wired to medium speed. For low speed, remove BLU wire from medium tap and connect to low speed tap. For high speed, remove BLU wire from exisiting speed tap and remove BRN jumper wire from high speed tap. Tape off unconnected end of BRN jumper.

Typical control wiring schematics (cont)

TYPICAL AQUAZONE™ UNIT WITH DELUXE D AND LON CONTROLLER, THREE-PHASE (460/575 V)



LEGEND

AL	—	Alarm Relay Contacts
BM	—	Blower Motor
BMC	—	Blower Motor Capacitor
BR	—	Blower Relay
CB	—	Circuit Breaker
CC	—	Compressor Contactor
CCH	—	Crankcase Heater
CO	—	Sensor, Condensate Overflow
FP1	—	Sensor, Water Coil Freeze Protection
FP2	—	Sensor, Air Coil Freeze Protection
HP	—	High-Pressure Switch
HPWS	—	High Pressure Water Switch
JW1	—	Clippable Field Selection Jumper
LOC	—	Loss of Charge Pressure Switch
MV	—	Motorized Valve
NEC	—	National Electrical Code
P1	—	Field Wiring Terminal Block
RVS	—	Reversing Valve Solenoid
TRANS	—	Transformer
TXV	—	Thermostatic Expansion Valve

*Optional Wiring.

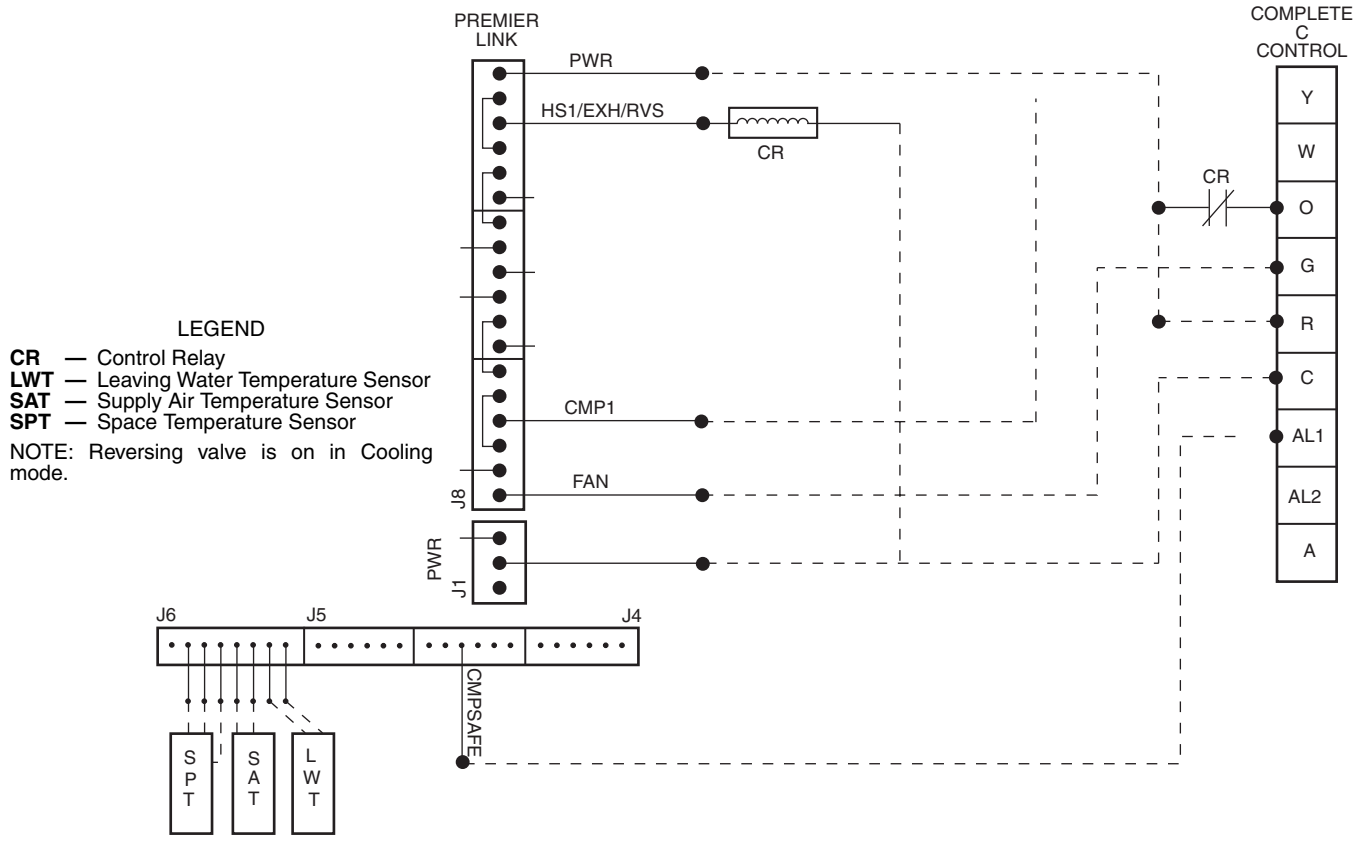
Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground

Wire Nut
Relay Contacts - N.C.
Relay Contacts - N.O.
Low Pressure Switch
High Pressure Switch
Splice Cap
Circuit Breaker

NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 460 v (BLK/RED) lead for 460/3/60 units, 575 v (GRY) lead for 575/3/60 units, or 380 v (VIO) lead for 380/3/50 units. For 420/3/50 operation, switch VIO and BRN leads at L1 and insulate VIO lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. Factory cut JW1 jumper. Dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Fan motors are factory wired for medium speed. For high or low speed, remove BLU wire from fan motor speed tap “M” and connect to “H” for high speed or “L” for low speed.
9. For low speed, remove BLK wire from BR “6” and replace with RED. Connect BLK and BRN wires together.
10. Optional LON wires. Only connect if LON connection is desired at the wall sensor.

PREMIERLINK™ CONTROLLER APPLICATIONS WITH COMPLETE C CONTROL

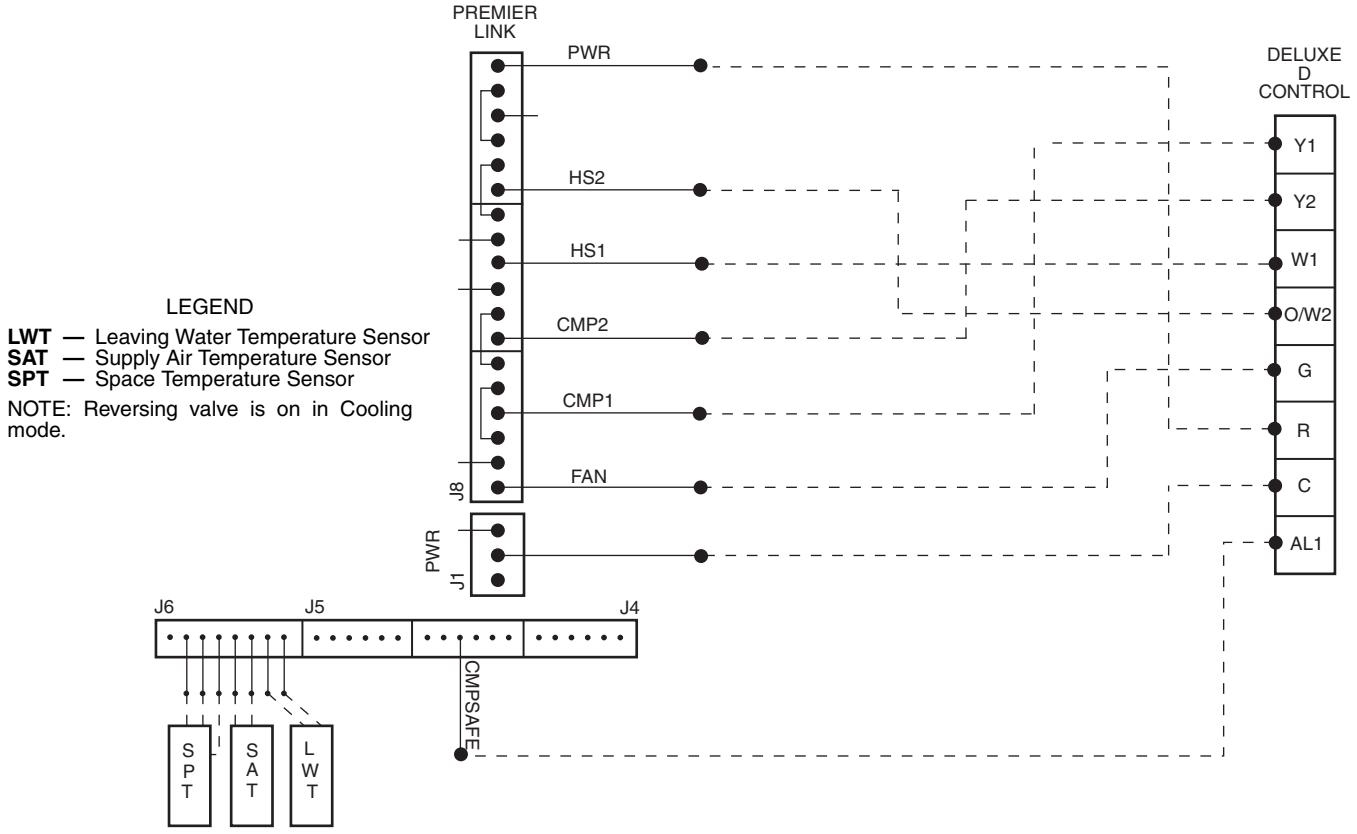


LEGEND

CR — Control Relay
LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

PREMIERLINK CONTROLLER APPLICATIONS WITH DELUXE D CONTROL



LEGEND

LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

Application data

Aquazone™ water source heat pump products are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Utilize Aquazone products to provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE SIZE (tons)	APPLICATION
50RHC,RVC Horizontal/Vertical	Standard Efficiency $^1/_2$-5 (RHC) $^3/_4$-5 (RVC)	Efficient, low cost alternative for retrofit or new boiler/tower systems.
50RHR,RVR Horizontal/Vertical	High Efficiency $^1/_2$-5	Efficient, adaptable unit for new boiler/tower, ground water, or ground loop systems.
50RDS,RHS,RVS Downflow/ Horizontal/Vertical	Premium Efficiency $1^1/_3$-6	Premium, ultra efficient unit for new boiler/tower, ground water, or ground loop systems
50PT	Premium Efficiency 2-5$^1/_2$	Premium, ultra efficient Puron® (R-410A) refrigerant 2-stage unit for new boiler/tower, ground water, or ground loop systems
50PS	Premium Efficiency $^1/_2$-6	Premium, ultra efficient Puron (R-410A) refrigerant unit for new boiler/tower, ground water, or ground loop systems
50HQL,VQL Horizontal/Vertical	Large Capacity 6-10 (HQL) 6$^1/_2$-25 (VQL)	Designed to handle large zoned areas for all applications.
50KQL	Console $^1/_2$-1$^1/_2$	Attractive design for finished interior, under-window installations.
50RTG	Rooftop 3-20	Economical solution for indoor air quality (IAQ) problems and tempering ventilation air.
50RWS	Water-to-Water 3-10	Used to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.
50PSW	Water-to-Water 28	Efficient Puron (R-410A) refrigerant alternative to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 2.25 and 3 gpm per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 60 F and 90 F. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance with the design of water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- Product application including horizontal, vertical, console, rooftop and water-to-water applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing IAQ issues such as condensate removal, humidity control.
- Air distribution design including diffuser selection/layout and ductwork design.
- Hydronic system design including pipe sizing/layout and boiler/tower sizing.
- Control configurations such as stand alone, DDC, DCV, and VVT® configurations.
- WSHP Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Ground water systems

To utilize Aquazone units in ground water applications, extended range should be specified. This will provide factory-installed insulation on the coaxial coil to prevent condensate from dripping when entering water temperatures are below 60 F. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Open loop system — This system is used where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system. This design limits the amount of piping and excavation required.

Aquazone units are provided with a standard TXV and are rated to extremely low temperatures to self-adjust the refrigeration circuit, therefore water regulating valves are not required on open loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. Piping is limited to the amount of pipe required to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to design considerations in the ground water system section.

Horizontal ground loop — This system is used when adequate space is available and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 3 to 6 feet below the ground surface, and then backfilled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground

conditions, heating, and cooling requirements of the application and system design.

Vertical ground loop — This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower into the ground loop system to reduce the overall cost. A hybrid system discards excess heat into the air and increases the cooling performance of the ground loop.

Condensate drainage

Venting — Condensate lines should be properly vented to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is an essential necessity on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, the water seal should be sized for 1 in. for every 1 in. of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units — Horizontal units should be sloped toward the drain at a $^1/_4$ in. per foot pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blow out the condensate drain. The design of a common trap or vent for multiple units is not acceptable. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units — Vertical units utilize a condensate hose inside the cabinet that acts as a trapping loop, therefore an external trap is not necessary. Each unit must be installed with its own vent and means to flush or blowout the condensate drain lines. Do not install a common trap or vent on vertical units.

Water conditioning

In some applications, maintaining proper water quality may require the use of higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are of importance when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*		Max Allowable Level	Coaxial Metal
	Ammonia, Ammonium Hydroxide	0.5 ppm	Cu
	Ammonium Chloride, Ammonium Nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	Cu
	Chlorine/Chlorides	0.5 ppm	CuNi
	Hydrogen Sulfide†	None Allowable	—
Brackish	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

Application data (cont)

Dehumidification

For dehumidification, Carrier has provided a modulating hot water reheat (HWR) function that meets and exceeds those specifications that call for hot gas reheat (HGR). Modulating HWR is a relatively new design that controls dehumidification by providing modulating HWR based on the desired leaving air temperature set point. Unlike the complicated refrigerant circuitry used in HGR, Carrier's HWR utilizes the condenser water and a water-to-air reheat coil, placed after the evaporator coil, to reheat the return air after it is conditioned by the air-to-refrigerant evaporator coil, providing 100% reheat regardless of season and water temperature.

Heat pumps with HWR having a sensible-to-total (S/T) ratio of 0.72 to 0.76 dedicate 25% of their total cooling capacity to moisture removal. When selecting a unit for both sensible and latent cooling, it is necessary to pay close attention to the latent cooling of the unit to ensure that the latent cooling load is satisfied by the unit selection. If the latent cooling load is not satisfied, than a larger unit with enough latent cooling is required for that specific application.

Unlike most hot gas reheat options, the HWR option will operate over a wide range of entering-water temperatures (EWTs). Special flow regulation (water regulating valve) is not required for low EWT conditions. However, below 55 F, supply-air temperatures cannot be maintained at 72 F because the cooling capacity exceeds the reheat coil capacity at low water temperatures. Below 55 F, essentially all water is diverted to the reheat coil (no heat of rejection to the building loop). Although the HWR option will work fine with low EWTs, overcooling of the space may result with well water systems or, on rare occasions, with ground loop (geothermal) systems. (NOTE: Extended range units are required for well water and ground loop systems.) Since dehumidification is generally only required in cooling, most ground loop systems will not experience overcooling of the supply-air temperature. If overcooling of the space is a concern (e.g., computer room well water application), auxiliary heating may be required to maintain space temperature when the unit is operating in the dehumidification mode. Water source heat pumps with HWR should not be used as makeup air units. These applications should use equipment specifically designed for makeup air.

Acoustical design

Sound power levels represent the sound as it is produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces where people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by Noise Criteria (NC) curves. Noise Criteria (NC) curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert NC levels from the unit ratings in terms of sound power (Lw). This conversion depends on the specifics of the acoustical environment of the installation.

The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design.

Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- Type of acoustical ceiling
- Use of metal or flex duct
- Absorption in the occupied space
- Location in the occupied space
- Open or closed layout plan
- Use of open or ducted returns
- Orientation of unit to occupant
- Use of lined or unlined duct

OCTAVE BAND SOUND PRESSURE LEVEL (Lp) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (Lp)							
	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

WSHP sound control

The analysis of the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. In combination with utilizing standard Aquazone™ equipment attenuating features or the advanced mute package features, suggestions for horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 feet between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 6 feet away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 20 feet of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft run-out duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an "attenuating end-effect" and reduces duct-transmitted sound before it reaches the space. Typically a 6 dB sound reduction can be accomplished with the use of flex duct.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.
20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or "L" shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.
21. Do not hang suspended ceiling from the ductwork.

Vertical units

All guidelines established for horizontal units also apply for vertical units. In addition, since vertical units tend to be installed in small equipment rooms or closets, the following additional guidelines apply:

1. Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-site noise into the space.
3. Follow good duct design practice in sizing and locating the connection of the WSHP discharge to the supply duct system. Use an elbow with turning vanes and bent in the direction of the fan rotation to minimize turbulence. Make any duct transitions as smooth and as gradual as possible to again minimize turbulence and loss of fan static pressure.

Application data (cont)

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (32 F) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Design care should be used when selecting both the type and concentrations of glycol utilized due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions.
- Loss of piping pressure may increase greatly, resulting in higher pumping costs.
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system.
- Acidity of the water may be greatly increased, promoting corrosion.
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

TYPICAL UNIT OPERATING PRESSURES AND TEMPERATURES

ENTERING WATER TEMP (F) (EWT)	GPM/ TON	COOLING						HEATING					
		Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Super-heat (F)	Sub-cooling (F)	Water Temp Rise (F)	Air Temp Drop (F) DB	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Super-heat (F)	Sub-cooling (F)	Water Temp Drop (F) DB	Air Temp Rise (F)
30	1.5	75-85	90-105	25-40	12-20	21-24	21-26	34- 39	167-186	12-16	1-4	7.6- 8.4	14-20
	2.3	74-84	80- 95	25-40	11-18	13-16	21-26	37- 43	172-191	12-16	1-4	4.8- 5.6	16-22
	3.0	73-83	70- 85	25-40	10-16	6-11	21-26	40- 46	177-196	12-16	1-4	3.4- 4.2	16-22
50	1.5	75-85	125-155	12-20	10-18	20-23	20-25	50- 60	180-210	10-17	1-5	10.8-11.9	23-29
	2.3	74-84	120-142	12-20	9-16	12-15	20-25	53- 62	185-215	10-17	1-5	6.7- 8.1	24-30
	3.0	73-83	115-138	12-20	8-14	8-12	20-25	55- 65	190-220	10-17	1-5	5.1- 5.9	25-31
70	1.5	75-85	179-198	9-16	8-15	19-22	19-24	71- 82	205-230	14-19	1-5	14.0-15.2	28-34
	2.3	74-84	168-186	9-16	8-14	12-17	19-24	73- 85	210-238	14-19	1-5	9.0-10.2	30-37
	3.0	73-83	158-175	9-16	8-12	7-12	19-24	76- 88	215-242	14-19	1-5	6.7- 7.9	31-38
90	1.5	75-85	229-251	9-17	8-15	18-21	17-23	85- 95	220-260	18-28	2-5	14.4-16.6	32-39
	2.3	74-84	218-241	9-17	8-14	10-14	17-23	90-100	225-265	18-28	2-5	10.8-12.4	33-41
	3.0	73-83	208-230	9-17	8-12	6-11	17-23	95-105	230-270	18-28	2-5	7.2- 8.3	35-42
110	1.5	77-87	280-320	8-15	10-25	17-20	15-20						
	2.3	76-86	270-310	8-15	10-24	9-13	15-20						
	3.0	75-85	260-300	8-15	10-22	5-10	15-20						

LEGEND

DB — Dry Bulb
EAT — Entering-Air Temperature

NOTES:

1. Based on nominal 400 cfm per ton airflow, 70 F EAT heating and 80/67 F EAT cooling.
2. Cooling air and water numbers can vary greatly with changes in humidity.
3. Subcooling is based upon the head pressure at compressor service port.
4. Unit should not be operated in heating mode with an EWT of 110.

WATER TEMPERATURE CHANGE THROUGH HEAT EXCHANGER

WATER FLOW RATE (GPM)	COOLING RISE (F)		HEATING DROP (F)	
	Min	Max	Min	Max
For Closed Loop: Ground Source or Cooling/Boiler Systems at 3 gpm/ton	9	12	4	8
For Open Loop: Ground Water Systems at 1.5 gpm/ton	20	26	10	17

Guide specifications

Packaged Water Source Heat Pumps

HVAC Guide Specifications

Size Range: **14,100 to 63,700 Btuh Cooling Capacity**
16,300 to 78,300 Btuh Heating Capacity

Carrier Model Number: **50RDS, 50RHS, 50RVS**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install water source heat pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be horizontal, vertical, or downflow configurations.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 60 to 95 F as standard (20 to 110 F on extended range models).

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

C. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with ARI/ASHRAE/ISO 13256-1 performance standard and ETL listed to UL standard 1995. The units shall have ARI/ISO, NRTL, and ETL labels. Units shall exceed ASHRAE 90.1 Energy Standards. Water source heat pumps shall be New York City MEA (Materials Equipment and Acceptance) 60-00-E rated.

B. All units shall be factory tested under normal operating conditions at nominal water flow rates. This testing shall generate a report card to be shipped with each unit stating performance in both Heating and Cooling modes.

C. Serial numbers will be recorded by factory and furnished to contractor for ease of unit warranty status. Units which are tested without water flow rates are not acceptable.

Part 2 — Product

2.01 EQUIPMENT

A. General:

1. The horizontal and vertical heat pumps shall be fabricated from heavy gage galvanized sheet metal. All interior surfaces shall be lined with $1/2$ in. thick, $1\,1/2$ lb acoustic type fiberglass insulation. All fiberglass shall be coated and have exposed edges tucked under flanges to prevent the introduction of glass fibers into the airstream. All insulation must meet NFPA 90A.
2. Units shall be prewired and precharged in factory.

B. Unit Cabinet:

1. Units must have the ability to be field convertible from side to back or back to side discharge with no additional parts or unit structure modification. Units will have factory-installed hanger brackets and isolation grommets.
2. Horizontal units shall have one of the following airflow arrangements: right-discharge and left-return; left-discharge and right-return; back-discharge and left-return; or back-discharge and right-return as shown on the plans.
3. Vertical units shall have one of the following airflow arrangements: left-return and top-discharge, or right-return and top-discharge. All vertical units will be supplied from the factory internally trapped.
4. Downflow units shall have one of the following airflow arrangements: left-return and bottom-discharge or right-return and bottom-discharge.
5. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades.
6. Cabinets shall have separate openings and knockouts for entrance of line voltage and low voltage control wiring. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.
7. All units must have a minimum of three access panels for serviceability of compressor compartment. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect must approve any changes in layout.
8. All units must have an insulated panel separating the fan compartment from the compressor compartment.
9. Optional mute package shall consist of high technology sound attenuating materials that are strategically applied to the cabinet, in addition to the standard system, to further dampen sound.
10. Units with the compressor in the airstream are not acceptable.

C. Fan and Motor Assembly:

1. Units rated 60,000 Btuh and under shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed, permanently lubricated, PSC (permanent split capacity) type with internal thermal overload protection.
2. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
3. Units supplied without permanently lubricated motors must provide external oilers for easy service.

4. The fan motor shall be isolated from the fan housing by torsionally flexible isolation grommets. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule.
5. CFM/static pressure rating of the unit shall be based on a wet coil and a clean filter in place.

D. Refrigerant Components:

1. Units shall have a sealed refrigerant circuit including a premium efficiency scroll or rotary compressor designed for heat pump operation.
2. Units shall have a thermostatic expansion valve for refrigerant metering, an enhanced aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, a reversing valve, a coaxial (tube-in-tube) refrigerant-to-water heat exchanger.
3. The compressor will be mounted on external computer selected isolating springs. The external springs will be secured to rails that are isolated from the cabinet base. Compressor shall have thermal overload protection and be located in an insulated compartment away from airstream to minimize sound transmission.
4. Refrigerant-to-air heat exchangers shall utilize enhanced lanced aluminum fins and rifled copper tube construction rated to withstand 450 psig refrigerant working pressure.
5. Refrigerant-to-water heat exchangers shall be of copper inner-water tube and steel refrigerant outer tube design, rated to withstand 450 psig working refrigerant pressure and 450 psig working water pressure. Plate-to-plate heat exchangers cannot be used.
6. Refrigerant metering shall be accomplished by thermostatic expansion valve only. Units intended for use in standard operating range with entering water temperatures from 60 to 95 F.
7. Reversing valves shall be four-way solenoid activated refrigerant valves which shall fail to heating operation should the solenoid fail to function. If the reversing valve solenoid fails to cooling, a low temperature thermostat must be provided to prevent over-cooling an already cold room.
8. Optional cupronickel coaxial water-to-refrigerant heat exchangers.
9. Optional extended range for units operating with entering water temperatures below dew point. For use in operating range with entering water temperatures from 20 to 110 F.
10. Optional water circuit options including hot water generator (HWG) coil, HWG coil with 2.5 gpm per ton autoflow regulator, autoflow regulator sized for 2.5 gpm per ton, and autoflow regulator sized for 3.0 gpm per ton.

E. Drain Pan:

The drain pan shall be constructed to inhibit corrosion and is fully insulated. Drain outlet shall be located on pan as to allow complete and unobstructed drainage of condensate. Vertical units will be supplied with factory-installed trap inside of cabinet. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches are not acceptable.

F. Filter:

1. Units shall have a factory installed 1 in. wide filter bracket for filter removal from either side. Units shall have a 1 in. thick throwaway type fiberglass filter.
2. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up.
3. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.
4. Field-installed 2 in. filter brackets and 2 in. fiberglass throwaway filters on all units can be installed by contractor.

G. High-Static Blower:

Provides increased airflow at various static pressure conditions. Available in sizes 030 and 036 for 50RDS, RHS, RVS units.

H. Controls and Safeties:

1. Electrical:
   a. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 2 or 3-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electromechanical operation is not acceptable.
   b. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor.
2. Piping:
   a. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.
   b. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.

3. Unit Controls:
   a. Safety controls including a high-pressure switch, a low-pressure sensor, and a low water and low air temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
   b. Activation of any safety device shall prevent compressor operation via a lockout device. The lockout shall be reset at the thermostat or at the contractor-supplied disconnect switch.
   c. Units which may be reset only at the disconnect switch only shall not be acceptable.
4. The standard Complete C electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:
   a. 50-va transformer.
   b. Performance Monitor (PM). The PM warns when the heat pump is running inefficiently.
   c. Anti-short cycle time delay on compressor operation time delay shall be 5 minutes minimum.
   d. Random start on power up mode.
   e. Low voltage protection.
   f. High voltage protection.
   g. Unit shutdown on high or low refrigerant pressures.
   h. Unit shutdown on low water temperature.
   i. Water coil freeze protection (selectable for water or antifreeze).
   j. Air coil freeze protection (check filter switch).
   k. Condensate overflow shutdown.
   l. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
   m. Automatic intelligent reset. Unit shall automatically reset 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially then permanent lockout will occur.
   n. Ability to defeat time delays for servicing.
   o. Light-emitting diodes (LED) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status.
   p. The low-pressure switch SHALL NOT be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
   q. Remote fault type indication at thermostat.
   r. Selectable 24-v or pilot duty dry contact alarm output.
   s. 24-v output to cycle a motorized water valve with compressor contactor.
   t. Electric heat output to control two stages of electric heat (emergency heat).
   u. Service test mode for troubleshooting and service.
5. Optional electronic Deluxe D control shall have all the features of the Complete C control with the following additional features:
   a. 75-va transformer.
   b. A removable thermostat connector.
   c. Random start on return from night setback.
   d. Intelligent reversing valve operation for extended life and quiet operation.
   e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   f. Dry contact night setback output for digital night setback thermostats.
   g. Ability to work with heat/cool (Y, W) thermostats.
   h. Ability to work with heat pump thermostats using O or B reversing valve control.
   i. Single grounded wire to initiate night setback, or emergency shutdown.
   j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
   k. Dehumidistat input providing fan control for dehumidification operating.
   l. Multiple units connected to one sensor providing communication for up to 3 water source heat pumps.
   m. Selection of boilerless changeover temperature set point.
   n. Compressor relay staging for dual stage units or in master/slave applications.
6. PremierLink™ Controller:

   This optional control will function with CCN (Carrier Comfort Network®) and Comfort-VIEW™ software. It shall also be compatible with *Comfort*Link™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO_2 sensor in the conditioned space and be demand controlled ventilation (DCV) ready. The communication rate must be 38.4K or faster. It shall include an integrated economizer controller.
7. LonWorks® Interface System:

   Units shall have all features listed above (either Complete C or Deluxe D) and the control board shall be supplied with an optional LonWorks

interface board, which is LONMark® certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. space temperature
b. leaving-water temperature
c. discharge-air temperature
d. command of space temperature set point
e. cooling status
f. heating status
g. low temperature sensor alarm
h. low pressure sensor alarm
i. high pressure switch alarm
j. condensate sensor alarm
k. high/low voltage alarm
l. fan "ON/AUTO" position of space thermostat
m. unoccupied/occupied command
n. cooling command
o. heating command
p. fan "ON/AUTO" command
q. fault reset command
r. itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75 va control transformer with load side short circuit and overload protection via a built-in circuit breaker.

8. Optional modulating hot water reheat (HWR), composed of supply air sensor, motorized valve, proportional controller, loop pump, and hydronic coil.
9. An optional two-way motorized control valve can be provided with a copper heat exchanger for applications involving open type systems or variable speed pumping.

I. Special Features:

1. Aquazone™ Thermostat Controls:
   a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
   b. Programmable 7-day light activated thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
   c. Programmable 7-day flush mount thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
   d. Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
   e. Non-programmable thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.
2. Loop controller with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter rack (2 in.) to enhance the filtration system of the water source heat pump.

   NOTE: Filter rack does not include filters.
4. Fire-rated hose kits with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
5. Ball valves (brass body) for shut off and balancing water flow. Available with memory, with memory stop, and pressure temperature ports.
6. Y strainers (bronze body) “Y” type configuration with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel.
7. Solenoid valves (brass body) provide slow operation for quiet system application.
8. Hose kit assemblies include a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple.
9. Remote sensors for Aquazone flush-mount thermostats.
10. PremierLink™ accessories for providing a fully integrated DDC system. Accessories include supply air temperature sensors, communicating room sensors, CO_2 sensors, and linkage thermostats.
11. An Aquazone system control panel as specified in 50RLP Product Data (525-00040) is available.